



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

LL

KF 27

.5

.E95

1919a

ser. 2

v. 37

Copy 1

Serial 2-Pt. 37





Class D570
Book A2A622

V
=

S
,

U
"

132894
5155-K

WAR EXPENDITURES

HEARINGS

BEFORE

SUBCOMMITTEE No. 1

(AVIATION)

OF THE

SELECT COMMITTEE ON EXPENDITURES
IN THE WAR DEPARTMENT

U.S. Congress HOUSE OF REPRESENTATIVES

SIXTY-SIXTH CONGRESS

FIRST SESSION

ON

WAR EXPENDITURES

HON. JAMES A. FREAR, *Chairman*

HON. WALTER W. MAGEE

HON. CLARENCE F. LEA

Serial 2—Part 37



Dup. 1920
D. of D.

WASHINGTON
GOVERNMENT PRINTING OFFICE
1919

Am. Soc. of Engineers

SELECT COMMITTEE ON EXPENDITURES IN THE WAR DEPARTMENT.

HOUSE OF REPRESENTATIVES.

WILLIAM J. GRAHAM, Illinois, *Chairman.*

JAMES A. FREAR, Wisconsin.

HENRY D. FLOOD, Virginia.

JOHN C. MCKENZIE, Illinois.

FINIS J. GARRETT, Tennessee.

ROYAL C. JOHNSON, South Dakota.

FRANK E. DOREMUS, Michigan.

C. F. REAVIS, Nebraska.

JEROME F. DONOVAN, New York.

WALTER W. MAGEE, New York.

CLARENCE F. LEA, California.

ROSCOE C. McCULLOCH, Ohio.

OSCAR E. BLAND, Indiana.

ALBERT W. JEFFERIS, Nebraska.

CLARENCE MacGREGOR, New York.

NEWTON H. SHAW, *Clerk.*

II

LIBRARY OF CONGRESS

DEC 18 1936

DIVISION OF DOCUMENTS

Ans. 13. 37

D 570
A2A682

WAR EXPENDITURES.

SUBCOMMITTEE No. 1 (AVIATION)
OF THE SELECT COMMITTEE ON
EXPENDITURES IN THE WAR DEPARTMENT,
HOUSE OF REPRESENTATIVES,
Washington, D. C., November 7, 1919.

The subcommittee met at 10 o'clock a. m. on call of the chairman, Hon. James A. Frear (chairman) presiding.

Also present: Hon. Walter W. Magee and Hon. Clarence F. Lea.

TESTIMONY OF MR. WILLIAM A. WELCH, HAVERSTRAW, N. Y.

The witness was duly sworn by Mr. Frear.

Mr. FREAR. Mr. Welch, will you please give you name and address to the reporter?

Mr. WELCH. William A. Welch; Haverstraw, N. Y.

Mr. FREAR. How long have you lived there?

Mr. WELCH. Six years.

Mr. FREAR. Were you engaged in the spruce production business; if so, in what capacity and where?

Mr. WELCH. I was commissioned in May, 1918, and ordered to report to Portland, Oreg., to Gen. Disque, or Col. Disque, he was at that time, for duty with the Signal Corps.

Mr. FREAR. What was your business in private life?

Mr. WELCH. I am a civil engineer.

Mr. FREAR. What was your commission?

Mr. WELCH. I was appointed division engineer of the division and put in charge of construction work.

Mr. FREAR. No; what I mean is, what was your title?

Mr. WELCH. Division engineer.

Mr. FREAR. I mean your military title.

Mr. WELCH. I was a major, but at that time a captain.

Mr. FREAR. Who appointed you to the Spruce Production Division?

Mr. WELCH. The War Department assigned me there.

Mr. FREAR. At whose request?

Mr. WELCH. I do not know.

Mr. FREAR. At your own request?

Mr. WELCH. No, sir.

Mr. FREAR. Were you acquainted with any persons there?

Mr. WELCH. I knew none of them.

Mr. FREAR. All right. Will you now go on and briefly state your connection with the service, and give any information you may have to give to the committee,

Mr. WELCH. Immediately after arriving there I made an inspection—

Mr. FREAR (interposing). What time was that?

Mr. WELCH. In June.

Mr. FREAR. 1918?

Mr. WELCH. Yes, sir.

Mr. FREAR. Go ahead.

Mr. WELCH (continuing). Over all the proposed railroad projects of the division.

Mr. FREAR. Of what, the Spruce Production Division?

Mr. WELCH. Yes, sir. Also all the proposed sawmill sites that they were to erect.

Mr. FREAR. Had those projects been determined upon at that time, before you went out there?

Mr. WELCH. The Clallam road contract had been let when I reached there, and the engineers had been in the field for some time, and a good deal of it was located.

Mr. FREAR. What about the Yaquina Bay route to the Blodgett tract?

Mr. WELCH. The road to the south from Yaquina Bay down toward the Blodgett tract was nearly all located and construction was started on it.

Mr. FREAR. Contracts had been let?

Mr. WELCH. And contracts had been let. The one to the north had not been decided upon. They were debating as to whether to go on top of the ridge or watershed back from the ocean or to go along by the coast to get out the timber.

Mr. FREAR. No contract had been let for that at the time?

Mr. WELCH. The line had not been decided upon. I went over that line first—

Mr. FREAR (interposing). Which line?

Mr. WELCH. Both of them.

Mr. FREAR. You mean what by "both of them"?

Mr. WELCH. The ridge road and the one north from Yaquina Bay; the ridge road running north from Toledo and the line as constructed running through from Yaquina Bay.

Mr. FREAR. What you you mean by "the Ridge Road"?

Mr. WELCH. The line that had been surveyed and proposed to the division to run from Toledo, an extension of a little narrow-gauge road that ran out of Toledo.

Mr. FREAR. Do you mean the old Miller Road as it is called?

Mr. WELCH. Yes, sir; the old Miller Road, so-called.

Mr. FREAR. Wasn't there a survey leading along the top of the ridge or divide which was near the coast, but not the coast line?

Mr. WELCH. Well, that is the one I mean by the ridge road.

Mr. FREAR. This road from Toledo north must be 10 miles away from the coast.

Mr. WELCH. Further to the east; yes, sir.

Mr. FREAR. That is the one you have in mind?

Mr. WELCH. Yes, sir; that is the one I have in mind. It was to be an extension of the Toledo Road.

Mr. FREAR. Or Miller Road?

Mr. WELCH. From Yaquina Bay on the watershed and follow the watershed in the direction of Bulls Bag of the Siletz to the big bend of the Siletz. There was also a reconnaissance made north from the end of the Miller Road to the east of that ridge, with the idea of getting into the spruce in that same section, and down the Siletz River. I examined those surveys and the reports that were made on them, and went over that ridge road, and recommended that the road be constructed by the coast rather than by the ridge.

Mr. FREAR. Who did you recommend that to and on what did you make the recommendation?

Mr. WELCH. I made the recommendation to the commanding officer of the division, and because in my judgment the ridge road on top of that ridge would have necessitated having all the spurs that might be put off from it into the spruce with heavy grades against the loads. It would have been on the highest ground in the timber.

Mr. FREAR. What grade against the loads did you find from your investigation?

Mr. WELCH. The grades against the loads would have all been on the spurs. There was very little on the main road. There would have been some but it would have been necessary to work the grade up to stay on the ridge.

Mr. FREAR. The divide was on the west of what you would call this division ridge, wasn't it?

Mr. WELCH. It was between the valley of the stream that the Miller Road runs up and the Siletz River and the ocean.

Mr. FREAR. The divide would be west of that, wouldn't it?

Mr. WELCH. Well, west of that valley; yes, sir. Between that valley and the ocean.

Mr. FREAR. Your testimony is that the timber which was up along that divide would have had to be brought against the grade.

Mr. WELCH. The most of the timber was on the west of the divide, like this [indicating], the ocean being to the west here and the Siletz Valley and the Miller Creek Valley here [indicating] but I do not remember the name of that creek, but the creek that runs into Toledo Bay; the most of the spruce according to the cruises, was on the west of that slope.

Mr. FREAR. On the west of that slope?

Mr. WELCH. Yes, sir.

Mr. FREAR. We have had about six or seven witnesses, including three cruisers, to the effect that there was 55,000,000 feet of spruce there on the east side, whereas there was about 150,000,000 feet, most of it, I think, unfit for airplane stuff, on the other side.

Mr. WELCH. How far to the north?

Mr. FREAR. Running up the Siletz Valley.

Mr. WELCH. My understanding, and my understanding from the reports of the cruisers, on which I based my recommendation, was that until you passed the big bend of the Siletz and got into the Jack Creek country, I think it is, there was only about 22,000,000 feet of airplane spruce on the east side of the divide.

Mr. FREAR. How many miles would that be from where the Miller Road would have had to be extended; the Miller Road ran up about 5 miles I think.

Mr. WELCH. My recollection is about 10 miles.

Mr. FREAR. That is, you would have had to go about 10 miles north to strike how much spruce?

Mr. WELCH. I do not know how much; I do not know that the cruisers segregated that. But the Miller Road, and to the summit, to the creek that runs into Toledo, and the Siletz River, there was about 22,000,000 feet of airplane spruce.

Mr. FREAR. Let me see if I understand: We would have had to extend the Miller road 10 miles to strike 22,000,000 feet of spruce.

Mr. WELCH. No, sir.

Mr. FREAR. Let us get that right, then.

Mr. WELCH. The Miller road itself, with the extension, would tap that. To get at the other big body of spruce, as I recall it, it would be necessary to go over that divide and down the Siletz Valley about 10 miles farther.

Mr. FREAR. What was your survey—and while we are on this subject I will say that I was unaware that it was to be taken up—but what did your surveys disclose would be the grades going over the divide on the Miller road going north?

Mr. WELCH. As I remember it it was only about 2 per cent. I am not positive about that. I have not looked at it for more than a year.

Mr. FREAR. That is true as we have it.

Mr. WELCH. But there was a further consideration in my mind when I made that recommendation, that the road if put out closer to the coast would tap all the timber on the west side of the divide if necessary; and if we had to go on and get all of the production we were told to get we would go up the creek to the east of Otter Rock Summit and down Jack Creek and tap a big body of spruce in the big bend of the Siletz, and that this road so located out there might have and would have some salvage value and some future use.

Mr. FREAR. That is because it might become a part, as it has been suggested to the committee—and I am inquiring of you now if that is so in regard to your idea of the salvage value—it might become a part of the Southern Pacific and have a value as a coast road?

Mr. WELCH. As a coast road; yes, sir; but not necessarily a part of the Southern Pacific.

Mr. FREAR. Well, that is the only road it could connect with.

Mr. WELCH. It is all that it does connect with.

Mr. MAGEE. It is nothing but an extension of the Southern Pacific.

Mr. WELCH. It connects with the Southern Pacific at Yaquima, or with a branch.

Mr. MAGEE. From Yaquima Bay?

Mr. WELCH. Yes, sir.

Mr. FREAR. At Otter Rock the testimony was offered to us, and I am inquiring whether it was correct or not, to the effect that it would require a long tunnel if the road were projected beyond that point because of obstacles in the shape of a mountain or high elevation at Otter Rock; do you remember anything as to that?

Mr. WELCH. I remember very distinctly that we located a line over the top of Otter Rock with a grade under 3 per cent, and we did not need a tunnel to get over it, but we abandoned the idea of staying close to the coast and going over Otter Rock because we discovered this other pass to the northeast that took us over the divide and down into the valley of the Siletz on a better grade and a better line.

Mr. FREAR. How long were you in that vicinity before you determined upon the location of the road? I mean, what examination did you make; just tell the committee.

Mr. WELCH. I only spent two days actually in the field. The rest of my information I secured from men I sent into the field to make reconnaissances.

Mr. FREAR. What men did you send into that particular field?

Mr. WELCH. Capt. Harman—

Mr. FREAR (interposing). Was he a logger or a cruiser?

Mr. WELCH. No, sir; he was an engineer. It was simply a railroad proposition.

Mr. FREAR. Well, I was referring to the amount of spruce there.

Mr. WELCH. No; I only depended upon the cruises as shown to me.

Mr. FREAR. By whom?

Mr. WELCH. By the division; by the records in the office.

Mr. FREAR. All right.

Mr. WELCH. And I sent a number of Capt. Harman's assistants.

Mr. FREAR. State to the committee about the situation in Clallam County, if you will.

Mr. WELCH. When I went over the Clallam County situation first in June, they were at work on the road in one or two places, a preliminary line had been run through, and the engineers were engaged in the final location. And they were getting supplies and material and men and camps into the country. I looked over that portion of the line which was located and over the portion west of Lake Crescent down to Lake Pleasant on the proposed location, and my first impression was that possibly from Lake Crescent west to the State highway it could be taken over and the road laid on that.

Mr. FREAR. About what distance north of the road as eventually laid out was that State highway?

Mr. WELCH. I do not—

Mr. FREAR (interposing). I do not think we have any testimony on that.

Mr. WELCH. It practically parallels it.

Mr. FREAR. For about what distance?

Mr. WELCH. From a mile to 3 or 4 miles. It is in the same valley.

Mr. FREAR. On the Soleduck River?

Mr. WELCH. Yes, sir.

Mr. FREAR. Let me ask if a part of that road isn't on the other side of the mountain that separates the Soleduck River?

Mr. WELCH. No, sir; the highway and the road come into the valley of the Soleduck River at the same point.

Mr. FREAR. All the way from Lake Crescent to Lake Pleasant?

Mr. WELCH. Yes, sir.

Mr. FREAR. You are positive of that?

Mr. WELCH. Yes, sir.

Mr. FREAR. All right.

Mr. WELCH. The railroad crosses the Soleduck River twice. The highway does not cross it at all, but stays on the north side of the river all the way down.

Mr. FREAR. And how close to the river?

Mr. WELCH. At some points in sight of it and in some points 2 or 3 miles from it. But after I considered the cost of reconstruction of this highway and the taking up of rails from it, the difficulties

that might be encountered in having that highway closed—and it was the only means of access for all that country from there down to the mouth of the Hoh—and the fact if it were utilized for the purpose the rails would have to be torn off of it entirely and there would be nothing left of the railroad but the railroad to Lake Crescent, I did not think it worth making a recommendation on, and gave it up.

Mr. FREAR. What were your instructions in regard to that?

Mr. WELCH. To express my opinion on it and nothing else.

Mr. FREAR. To whom?

Mr. WELCH. To Gen. Djsque.

Mr. FREAR. And that was in the month of June, did you say?

Mr. WELCH. Yes, sir.

Mr. FREAR. About what time in June?

Mr. WELCH. I think, sir, it was about the 15th as near as I can recall.

Mr. FREAR. That was after construction had been begun on the road?

Mr. WELCH. They had begun construction on the lower end, the portion going up to Lake Crescent.

Mr. FREAR. All right.

Mr. WELCH. I also examined at that time the question of a terminal for this road, or for any road in that peninsula, with the idea that practically all the timber in that peninsula must be marketed by water.

Mr. FREAR. That is, you mean a terminal on the eastern end?

Mr. WELCH. A terminal anywhere on the straits, at the eastern end of this railroad. I examined Port Crescent, which is, as I remember about 3 miles from the present connection of the Clallam County Road with the Seattle, Port Angeles & Western.

Mr. FREAR. At Joyce?

Mr. WELCH. Yes; at Joyce. And I found at Port Crescent that they had carried on logging operations for about 15 or 18 years, and that practically all the timber between the big mountains or between Lake Crescent and the coast in that vicinity had been taken out that way. There were a number of old wharves that had been abandoned for a good many years there, and I found two good hydrographic surveys of the port. It is a little port, which is crescent shaped, protected from all storms save from the northeast, and could be protected from those with a little breakwater; in fact, at one time it was figured on as a straits' terminal for a road in there.

Mr. FREAR. You were requested to make an investigation of that, were you?

Mr. WELCH. Yes, sir. There was a question up, I understand—I did not know it then but did know of it afterwards; that there was a question up of the rates the Milwaukee was going to charge on our logs from Joyce to Port Angeles. If they were exorbitant then we ought to have another way out.

Mr. FREAR. That was a factor in determining where the terminal should be?

Mr. WELCH. Yes, sir. The reason I investigated that port and Port Angeles and Port Discovery and all the harbors along the sound there was, as I said, because looking at the thing as a possible commercial proposition in the future it seemed that a matter of a

terminal on deep water was a requirement for any road in the peninsula.

Mr. FREAR. Did you look over Yaquina Bay?

Mr. WELCH. Yes, sir.

Mr. FREAR. That is where Carey at the outset expected to unload and raft his logs as he stated?

Mr. WELCH. Yes, sir.

Mr. FREAR. That is about 80 miles east of Lake Pleasant?

Mr. WELCH. Yes, sir. I looked at Clallam Bay, and I looked at the entrance of Pysht River. They were both valueless for any commercial purpose of that kind.

Mr. FREAR. That is, in your judgment?

Mr. WELCH. Yes, sir.

Mr. FREAR. You were not logging, but you saw them rafting and logging at both Clallam Bay and Pysht Bay?

Mr. WELCH. Yes, sir. And they have a booming ground in both of them for about 2,000,000 feet.

Mr. FREAR. How much booming ground did they have in Crescent Bay?

Mr. WELCH. I imagine, stating it as my own opinion but not as a logger but rather from an engineering point of view, that there is space for some 20,000,000 to 40,000,000 feet.

Mr. FREAR. Do you know how much they had rafted out of Crescent Bay?

Mr. WELCH. I was told by natives on the ground that they had 15,000,000 feet or 18,000,000 feet in there at the time. Then I took up the question of towing on the straits, which I had been told was a very dangerous business in the winter time particularly. So I went to the United States Weather Bureau at Port Angeles, and found a man who had been an observer at Port Crescent for 13 years, but had left there when it had been abandoned five years before and gone to Port Angeles. From him I got the records for 18 years; I got the wind records and the storm records for the whole of the 18 years. I also talked with four tug-boat captains who were at that time engaged in towing logs on the straits, and one of them had been towing them for 20 years and the other for 12 years or more, and the information they gave me—I do not remember the figures exactly, though they are in my report—but from my memory I think there was no period in that time of more than four days when it was not possible to have taken a raft through from Port Crescent around Dungeness. That is the point they call the entrance to the sound. There were periods as I remember it of about 40 days in the year when the wind averaged more than 25 miles an hour and those periods were about equally distributed between summer and winter. I can not recall all the figures, or my summing up of these things at the time, but I do remember that it would be possible and safe at all times of the year to tow cigar rafts from Port Crescent or Port Angeles into the sound, and for practically all of the year to tow flat rafts.

Mr. FREAR. By "cigar rafts" you mean what is known as the Davis system of rafting pursued at Clallam Bay?

Mr. WELCH. Yes, sir.

Mr. FREAR. And the other system of rafting is like that used by the Merrill-Ring people at Pysht Bay?

Mr. WELCH. Yes, sir.

Mr. FREAR. The Pysht Bay rafting is called flat rafting?

Mr. WELCH. Yes, sir.

Mr. FREAR. The committee has been all over that ground so that we are somewhat familiar with it.

Mr. WELCH. All right.

Mr. FREAR. What is the width of that strait there, 15 or 20 miles?

Mr. WELCH. Fifteen miles, I think.

Mr. FREAR. I think that is nearer to it.

Mr. WELCH. That is it as I remember it.

Mr. FREAR. What else did you do over there, Mr. Welch?

Mr. WELCH. I went up Pysht River and over to Lake Pleasant that way just one trip in a car.

Mr. FREAR. In an automobile?

Mr. WELCH. Yes, sir; and simply to satisfy myself as to whether it would be possible to go into that country that way. But the fact that appealed to me strongest against that route was that to have gone that way it would have been necessary to extend the main line of the Milwaukee to Pysht Bay and then up the river and on up there, and any line built that way would necessarily be an extension of that road.

Mr. FREAR. The Milwaukee road?

Mr. WELCH. Yes, sir.

Mr. FREAR. Of course the other route had been decided upon by that time.

Mr. WELCH. Yes, sir.

Mr. FREAR. But you knew at that time, did you, that Col. Disque had reported in favor of the extension of the Milwaukee road, at the outset?

Mr. WELCH. No, sir; I did not know that.

Mr. FREAR. Well, I did not know that you were going to be before the committee this morning, but happened to be reading in the record on yesterday, and will just call your attention to something along that line and ask you if you had any information in regard to it. Col. Disque wrote to Mr. R. F. Howe, at the Munsey Building, Washington, D. C., on April 8, 1918, according to the testimony before the committee, in which he said, among other things, and this is from page 2360 of our record:

3. It will be noted that the Milwaukee extension will immediately tap large stands of spruce timber between Deep Creek and the Pysht River, whereas the proposed Crescent Lake railroad must be extended its full length before any spruce will be available.

Is that a fact in your judgment, that it would require an extension for the full length before you would reach any particular body of timber on the Soleduck branch?

Mr. WELSH. Well, within five miles of the present length; yes, sir.

Mr. FREAR. He continued:

Furthermore, it is regarded by many excellent engineers as a very difficult problem to lay rail either along the north or the south bank of Crescent Lake, and those that are best equipped to discuss that problem state that the only practical means of using this line would be to ferry cars or product across Lake Crescent and connect with the Milwaukee near Port Angeles.

Did you make an examination as an engineer of the Lake Crescent surroundings at that time?

Mr. WELCH. Oh, yes; I walked clear along the shore of Lake Crescent where the road is now.

Mr. FREAR. What did you determine, if anything, at that time?

Mr. WELCH. That it was perfectly feasible to put a road along there.

Mr. FREAR. Feasible, but was it difficult or otherwise?

Mr. WELCH. It was rather difficult construction; yes, sir.

Mr. FREAR. The road was established on the north side of Lake Crescent?

Mr. WELCH. On the north side; yes, sir.

Mr. FREAR. What have you to say about the ledges of rock that would create slides because of the formation of the soil along the north side?

Mr. WELCH. There are two or three places, and I do not remember which, along there where it was necessary to take the slopes out back approximately to a $1\frac{1}{2}$ to 1 slope to prevent slides.

Mr. FREAR. What would that be, putting it in plain English?

Mr. WELCH. The natural slope that earth takes when you pour it out.

Mr. FREAR. It would have to be what?

Mr. WELCH. One and one-half feet back to 1 foot of elevation. In other words, $1\frac{1}{2}$ feet horizontal to 1 foot perpendicular.

Mr. FREAR. The reason I ask you is that it appeared for the first time last week in the testimony of Mr. Erling that that condition existed on the north side of Lake Crescent as he explained it to us.

Mr. WELCH. Yes, sir.

Mr. FREAR. The mountains on the north side of Lake Crescent extend to what height?

Mr. WELCH. I believe one of them named Mount Disque, and that is the highest and most prominent one on the north side, is 3,500 feet on top.

Mr. FREAR. That lake is surrounded by mountains?

Mr. WELCH. Yes, sir. The lake is about 500 feet above the sea level, and the mountain is about 3,000 feet higher.

Mr. FREAR. Go on with your further investigations made out there.

Mr. WELCH. I drove over the Pysht Creek route and, as I stated, the only question it raised in my mind was the one for future salvage—that any road up there would not have had the advantage of any independent connection from that of the Milwaukee road.

Mr. FREAR. That is, its salvage value, as I understand you to say, would depend upon what the Milwaukee road wished to pay for it?

Mr. WELCH. Yes, sir; what they would pay for it.

Mr. FREAR. I think that is clear.

Mr. WELCH. I also went over the proposed loop system of logging railroads that was built in connection with the spruce contract.

Mr. FREAR. That would be west of Lake Pleasant?

Mr. WELCH. Yes, sir.

Mr. FREAR. Describe briefly about the direction from Lake Pleasant that that loop went. We have a general understanding of it, but would like to know, briefly, what the situation is.

Mr. WELCH. It went north along the west shore of Lake Pleasant, climbing up on the divide, and over that to the west a little ways, and then to the south, and then to the southwest, and along

the ridge, and back to the southeast, and then the east, and then the northeast, and on up to a connection, forming a loop.

Mr. FREAR. In order to make it a matter of record, about how far north from the point of starting did this loop extend; how many miles?

Mr. WELCH. About 8 miles, I think.

Mr. FREAR. About 8 miles north, and then about how far west of Lake Pleasant would it reach; we have not any testimony on that specifically, as far as I know; about how many miles?

Mr. WELCH. I do not think more than 10 miles.

Mr. FREAR. Not more than 10 miles?

Mr. WELCH. No, sir; I do not think so.

Mr. FREAR. Then, about how far from this point on Lake Pleasant?

Mr. WELCH. Probably 6 miles.

Mr. FREAR. About 6 miles?

Mr. WELCH. Yes, sir.

Mr. FREAR. And then reaching back toward the lake?

Mr. WELCH. Yes, sir. And connecting with the same line north and west of the lake. It did not come back to the lake on that loop; the entire loop was to the west, the first ridge west of Lake Pleasant.

Mr. FREAR. Yes, but the loop would have to come back to the lake, would it not—if I understand correctly—in order to get your product out on this Government road to be built?

Mr. WELCH. There were two connections from the loop to Lake Pleasant, one at the north end of the loop and one at the south end of the loop. The loop acted independently of the two.

Mr. FREAR. And both of these, running from the north end of the loop and from the south end of the loop, connected with Lake Pleasant?

Mr. WELCH. Yes, sir.

Mr. LEA. How long was that loop?

Mr. FREAR. It ran about 8 miles north of Lake Pleasant and 6 miles south, as I understand.

Mr. WELCH. It was somewhere between 30 and 40 miles around it.

Mr. FREAR. About 10 miles across?

Mr. WELCH. It was not 10 miles across the loop; not more than 5 miles. The loop was 5 miles across at its center.

Mr. FREAR. I mean at the extreme limit of the loop it would be about 10 miles.

Mr. WELCH. Yes, sir.

Mr. LEA. In which direction do you mean that it would be 10 miles?

Mr. WELCH. It would be about 5 miles wide and 12 miles long.

Mr. FREAR. That is, the spruce would all be within that radius?

Mr. WELCH. Oh, no, sir. That was the loop, and they logged both ways from that with their logging roads.

Mr. FREAR. How far west of their westerly line would they be able to log?

Mr. WELCH. I do not believe there were any spurs that I saw projected, or that had been projected up to that time, that were more than 4 or 5 miles west of the loop.

Mr. FREAR. The loop was 5 miles west of Lake Pleasant?

Mr. WELCH. On one side, and on the other side about 10 miles. That would be the total distance, about 15 miles from Lake Pleasant to the end of the projected spur. That is, as I remember it.

Mr. FREAR. Did you estimate or have any estimates of the amount of spruce timber that was within that loop?

Mr. WELCH. No, sir.

Mr. FREAR. The testimony of Mr. Donlan, who was a logger for Mr. Carey, given before the committee the other day, was, that in that particular tract, if I understood him correctly, there were about 80,000,000 feet of airplane spruce.

Mr. WELCH. Well, I think that is what I was told, but I did not know anything about the timber.

Mr. LEA. What area do you refer to?

Mr. WELCH. Within the loop, or tapped by the loop.

Mr. LEA. He said 80,000,000 feet in the Hoko.

Mr. FREAR. Yes, sir; and then he said about 30,000,000 feet down on the Bogosheal, as I understood.

Mr. WELCH. I remember that there were some sections pointed out to me as having 20,000,000 feet.

Mr. FREAR. How much?

Mr. WELCH. Twenty million feet.

Mr. FREAR. He said there was more spruce, but he was speaking of airplane spruce.

Mr. WELCH. Well, while I was out there on the coast of airplane spruce on the Clallam Peninsula, in the Quinault country, between Gray's Harbor and Columbia, and south of Columbia in Oregon and down in the Yuquina district, and down at Marshfield and the Coos Bay country, there was good timber; and I think the best stand of airplane timber I saw anywhere was on the Elk River in one section.

Mr. FREAR. Where is that?

Mr. WELCH. South of Grays Harbor.

Mr. FREAR. South of Grays Harbor and between that and the Columbia River?

Mr. WELCH. Between that and Willoughby Bay.

Mr. FREAR. That is, how many miles north of the Columbia River? I am trying to fix it in our minds.

Mr. WELCH. Willoughby is about—

Mr. FREAR. Fifty miles?

Mr. WELCH. No, sir; not that far. Not over 30 miles, and across Willoughby Bay is about 15 miles, and then about 15 miles farther is this Elk River country.

Mr. FREAR. Then 15 miles more?

Mr. WELCH. Fifteen miles more into Grays Harbor; yes, sir.

Mr. FREAR. That is about 100 miles south of this Lake Pleasant timber?

Mr. WELCH. Yes, sir. But one section that they showed me—and I do not remember the name of the section—had more than 30,000,000 feet in it, according to the cruises, was well up on the side of the mountain on that loop.

Mr. FREAR. Who was logging that?

Mr. WELCH. This was to be logged by the Siems-Carey-H. S. Kerbaugh people.

Mr. FREAR. Where was that?

Mr. WELCH. I saw one section up in the Clallam country.

Mr. FREAR. Oh, but who was to log this Elk River country?

Mr. WELCH. It was the Paulson Logging Co., at Grays Harbor. It was their southern operation. I believe the Airplane Spruce & Lumber Corporation they called it.

Mr. FREAR. You spoke about this spruce. What else was there there?

Mr. WELCH. After I went over it and made an examination of it I thought it had been very well loaded out. The engineer with Mr. Kelliher, who did it—

Mr. FREAR (interposing). That was Carey's engineer?

Mr. WELCH. Yes, sir; formerly with the Milwaukee.

Mr. FREAR. Was he formerly with the Milwaukee?

Mr. WELCH. Yes, sir.

Mr. FREAR. It was Donovan, was it not?

Mr. WELCH. I do not know whether Donovan had ever been connected with the Milwaukee or not. He was a logger.

Mr. FREAR. You are thinking of the Bloodell Donovan.

Mr. WELCH. No; I know him.

Mr. FREAR. The testimony shows that there was a Donovan who was engaged in the service, and I was wondering if he was engaged in it when you were there.

Mr. WELCH. Yes, sir; there was a Donovan who was engaged in this service.

Mr. FREAR. He was the Donovan who had been with the Milwaukee, according to the testimony.

Mr. WELCH. When I organized the engineering department there they were nearly all taken from the western railroads.

Mr. FREAR. The western division of the Milwaukee?

Mr. WELCH. No, sir; the Union Pacific, the Southern Pacific, and all of the western railroads.

Mr. FREAR. The testimony here was that Donovan, of the Milwaukee Road, an engineer, was the one who was laying out the surveys, or Kelliher, whom you say was from the Milwaukee Railroad, and Sawyer, who was division superintendent and also a civil engineer of the Milwaukee, was in charge of operations.

Mr. WELCH. All operations there; yes, sir.

Mr. FREAR. How long were you there on the peninsula?

Mr. WELCH. I made probably a dozen trips to the peninsula during the summer.

Mr. FREAR. A dozen.

Mr. WELCH. No; I did not—not more than 10 trips, and never for more than two or three days at a time.

Mr. FREAR. What was the nature of your work each time? When you went out what did you do? Just give a general explanation so we may know how the situation was, and how the work was progressing, and how they were handling the thing. Did you give any instructions as to what should be done on those trips?

Mr. WELCH. I made some suggestions each time; yes, sir.

Mr. FREAR. What authority did you have, as you understood it, to give suggestions?

Mr. WELCH. That I was in charge of the construction work; and that these engineers were employed on that road for making weekly reports to me, and that I was to see that the work progressed as

rapidly as possible, and that it was done properly. I was on the go the most of the time because I had to cover not only the Clallam roads but all other roads.

Mr. FREAR. The Clallam road was the farthest away of all the roads from your headquarters?

Mr. WELCH. Yes, sir; and the hardest to get to.

Mr. FREAR. How far; two hundred or two hundred and fifty miles?

Mr. WELCH. About 250 miles; yes, sir.

Mr. LEA. From Portland?

Mr. WELCH. Yes, sir.

Mr. LEA. Your headquarters were at Portland?

Mr. WELCH. Yes, sir. It meant a night on the train and a day on the boat each time to get up there.

Mr. FREAR. To get to Port Angeles?

Mr. WELCH. Yes, sir.

Now, I would like to say just a word about a question, and one of the hardest that we had to solve, and that was what to do with the road when the armistice was signed.

Mr. FREAR. All right.

Mr. WELCH. At that time the track was laid to a point just west of Lake Crescent. The grade was completed to Lake Pleasant, and all the ties were out and the rails were on the ground—

Mr. FREAR (interposing). Do you mean that the ties were laid?

Mr. WELCH. No, sir; they were cut and placed along the right of way or stored where they could be reached by the train. There were temporary bridges at the two Soleduck crossings—one had been built and the other had a temporary bridge over it. The water tanks and station buildings and things of that sort were all ready for erection and the track-laying crew was on the ground and at work. I had been over the road just a few days before, not more than a week before the armistice was signed, and I was asked for a recommendation—

Mr. FREAR (interposing). By whom?

Mr. WELCH. By the division office. I think Gen. Disque was away at the time, but the request came to me from his office.

Mr. FREAR. From whom?

Mr. WELCH. Probably from Col. Stearns, who was the chief of staff and acting in Gen. Disque's place when he was away—as to what to do with the Clallam road. I was getting wires from every engineer in the division asking to be allowed to finish a mill, or finish the road, and to just let them cut one log, and all that sort of thing, and he asked me for that recommendation. After I thought the matter over for a day I recommended that the rail be laid.

Mr. FREAR. Did you recommend it in writing?

Mr. WELCH. Yes, sir.

Mr. FREAR. Where is that recommendation?

Mr. WELCH. It is in the records at Portland.

Mr. FREAR. The reason I ask that—and, as I stated before, I did not know that you were going to testify, Maj. Welch, but this statement appears on page 2384 of our record, in a telegram from Stearns to Disque:

Strongly recommend finishing of 14 miles of track Siems-Carey-Kerbaugh. Mr. Sawyer and Mr. Erling, of the Milwaukee, strongly recommend finishing of 14 miles of track laying and ballasting of Siems-Carey Road into Lake Pleas-

ant, basing opinion upon increased salvage value of completed road. Also on fact that large amount of equipment is at Lake Pleasant and freight of same out overland will cost approximately what the completion of track laying with light ballasting will cost.

That was dated November 14, I believe. I was going to ask you was there any reason why in this opinion given by Col. Stearns to Disque he did not quote you, who were the official representative, in giving that opinion; or, why he should confine it to Mr. Erling and Maj. Sawyer?

Mr. WELCH. I do not know of any, sir, unless it was that my recommendation had preceded those by some days.

Mr. FREAR. When was yours given?

Mr. WELCH. I do not remember, but it was given as soon as I got the information together about that. And there were a great many other projects that were up for consideration at the same time. But the things that led me to make my recommendation were practically what they say there, and I was familiar with the fact that there was a quantity of material and supplies at Lake Pleasant and out on the spurs of this logging railroad, or these logging railroads that were under construction under the spruce contract—and all that came to the Government on the cancellation of those contracts, and one of the most expensive things in the construction of that railroad had been the transportation problem.

Mr. FREAR. How had it been transported?

Mr. WELCH. All by motor trucks.

Mr. FREAR. All by Army trucks out over this highway?

Mr. WELCH. Yes, sir; and it was an awfully hard job.

Mr. FREAR. You had plenty of Army trucks with which to do it?

Mr. WELCH. Oh, yes; we had the trucks there. Then there was the further fact, and a most important one to my mind as an engineer, that a railroad completed, with the rails laid, was a very much more saleable proposition than a grade with the rails piled up somewhere else. We could not have salvaged the ties. I figured that it would cost less to lay those rails and ballast that road lightly enough to get that material out quickly before the rainy season came on than it would be to transport that material out of the country otherwise.

And then there was another consideration that entered into my figuring, that there were along that right of way and one of the most expensive features of construction was the clearing of the right of way from Lake Crescent west—there were something over eight million feet of marketable saw logs along that right of way that I felt sure could be sold for \$50,000 or maybe more. As a matter of fact they were sold for \$64,000.

Mr. FREAR. That is, from that section alone?

Mr. WELCH. On the ground; yes, sir.

Mr. FREAR. Was there not some of that that extended clear to the Lake Crescent road?

Mr. WELCH. Very little.

Mr. FREAR. What contract do you refer to now?

Mr. WELCH. I do not know what contract, but I just asked a member of the division whom I saw some months ago if he had sold those logs between Lake Crescent and Lake Pleasant, the right of way logs, and he said: "Yes, 8,000,000 feet brought \$60,000," as I remember, or \$64,000. But that is in writing.

Mr. FREAR. Let me ask you if you know in regard to that whether or not that contract was subject to the Government maintaining the railway for the purpose of bringing those logs out?

Mr. WELCH. No; I do not know about that.

Mr. FREAR. The committee has nothing before it as to that, and I am asking for information.

Mr. WELCH. No; I do not know about that. But that was one of the considerations that entered into my conclusion before I made that recommendation, and it seemed to me the wisest thing to do was to utilize those ties that were there and put them down, and put the rail down, to get that equipment out.

Mr. FREAR. That meant laying, as stated here, of 14 miles of railway?

Mr. WELCH. Thirteen or 14 miles of track.

Mr. FREAR. The water tanks were put up afterwards?

Mr. WELCH. No, sir. They were not put up. We recommended that they be not put up but be stored.

Mr. FREAR. You spoke of a temporary bridge structure, what was that?

Mr. WELCH. A temporary bridge structure on the north side of Lake Crescent. In order to get through there, they did not erect the Howe truss purchased to get over the arm of the lake and I recommended that that bridge be stored at Joyce and be not erected. There was another at one crossing up at the Soleduck River where there was a temporary pile structure across the river. Things were all in for the Howe truss bridge and the material was there and the lower cord in place and I recommended that that structure be completed.

Mr. FREAR. Was that bridge built?

Mr. WELCH. Yes, sir; it was completed.

Mr. FREAR. What was the size of it?

Mr. WELCH. As I remember it was a 120 or 150 foot span.

Mr. FREAR. What height?

Mr. WELCH. It was probably 30 feet, 25 feet above water.

Mr. FREAR. All right.

Mr. WELCH. There was a temporary structure in there that I knew would go out at the first big freshet. We all knew it when we put it in, but it had to be erected anyhow in order to erect the bridge.

Mr. FREAR. What was the longest bridge on that railroad?

Mr. WELCH. That was the longest single span, that Soleduck Bridge?

Mr. FREAR. What else have you in mind? Let me ask you: You were not in the military service prior to the war?

Mr. WELCH. No, sir.

Mr. FREAR. You were just appointed during the period of the war?

Mr. WELCH. Yes, sir.

Mr. FREAR. And throughout that work you were employed as an engineer?

Mr. WELCH. Yes, sir.

Mr. FREAR. Up until your discharge?

Mr. WELCH. Yes, sir.

Mr. FREAR. When were you discharged?

Mr. WELCH. I was discharged the 1st of March.

Mr. FREAR. 1919?

Mr. WELCH. Yes, sir.

Mr. FREAR. Have you anything more in mind?

Mr. WELCH. Nothing unless I can answer some question.

Mr. FREAR. Maybe Mr. Lea wishes to ask some questions.

Mr. LEA. When did you enter the military service?

Mr. WELCH. The 18th of May, 1918, I think it was.

Mr. LEA. At what location?

Mr. WELCH. Here at Washington.

Mr. LEA. What was your occupation before that?

Mr. WELCH. Chief engineer and general manager of the Palisades Interstate Park.

Mr. LEA. In New York?

Mr. WELCH. Yes, sir; and in New Jersey.

Mr. LEA. How long had you been in that position?

Mr. WELCH. Oh, about eight or nine years. Previous to that I had been building railroads for 27 or 28 years.

Mr. LEA. Where and to what extent.

Mr. WELCH. Throughout the Rocky Mountains, in the South and the Southwest, in Mexico and Alaska and South America and Central America.

Mr. LEA. Do you know of a place called Mullers Pass out there, at the headwaters of the Soleduck? I understand it is a watershed between the Soleduck and Lake Crescent, right where the road passes through.

Mr. WELCH. Yes; the Pass is west of Lake Crescent.

Mr. LEA. What is the lay of the land there?

Mr. WELCH. Well, on top is a swamp like you find usually on watersheds, and the ground slopes quite rapidly from the top down to Lake Crescent. It slopes more rapidly toward the east.

Mr. LEA. How much room is in there? The question has arisen before this committee whether or not another railroad could build through there, and we would like to know just what is the situation there. There are hills on both sides of the pass.

Mr. WELCH. Yes; the railroad itself goes through the Pass on a little bit lower ground than the highway. The highway goes through just to the south of the railroad. The pass is probably a quarter of a mile wide at the bottom over this little swamp, and to the north of it the hills are quite steeply, beginning at the edge of the swamp. To the south is a little bench 250 feet above the swamp, a little bit of land about a quarter of a mile, and then those mountains go up.

Mr. LEA. I do not know whether I made myself plain on it.

Mr. WELCH. Well.

Mr. LEA. I presume that the pass is through here with the mountains rising on both sides [indicating]?

Mr. WELCH. Yes, sir.

Mr. LEA. How near does the wagon road run from the railroad?

Mr. WELCH. Not more than a stone's throw.

Mr. LEA. The practical question that I wanted to have answered was whether or not there was room to build another railroad through that pass?

Mr. WELCH. Right in the pass there would be, but the difficulty of putting another railroad through there would be in getting from the lake to the pass if you were on the north side of Lake Crescent.

If the other road was on the south side of Lake Crescent, it could go through there between the highway and the present road.

Mr. LEA. I presume that the trouble—if your road was built on the north side of that—would be that you would have to pass over this road.

Mr. WELCH. It is perfectly impossible to build a road on the north side.

Mr. LEA. But you think it is possible on the south side?

Mr. WELCH. It is possible.

Mr. LEA. Is it practical.

Mr. WELCH. I would not consider it.

Mr. LEA. For what reason?

Mr. WELCH. It is on the inside of the crescent like that [indicating]. The only outlet from Lake Crescent is stream outlet, straight upward the present railroad runs. To get on the south side of the lake you would have to pass that stream where it goes out of the lake and go clear around this long arch of the lake and around probably 6 or 7 miles farther along the lake than the present road goes.

Mr. LEA. I did not make myself plain. Here is the Pass up here above Lake Crescent. I would be like an arch [indicating]. Do you consider it practicable to build on the south side of the Pass?

Mr. WELCH. Yes.

Mr. LEA. But your contention is that it is not practicable to build the road on the south side of the lake for that reason?

Mr. WELCH. Yes, sir; if there was any necessity for doing it, it would be practicable, but I can not see the necessity for it.

Mr. LEA. All I have in mind is that a road was to lead up along Lake Southerland, and it is purely this last question that I wanted information on.

Mr. WELCH. Yes; I understand.

Mr. LEA. Now, you spoke about that loop up at Lake Pleasant. I understand it is something like 40 miles.

Mr. WELCH. Between 30 and 40 miles, as I remember it, around it.

Mr. LEA. And where was the mill site to be at Lake Pleasant?

Mr. WELCH. At the southwest point of the lake.

Mr. LEA. And the loop runs from there?

Mr. WELCH. Two connections from the loop runs from there.

Mr. LEA. One goes south and the other northerly?

Mr. WELCH. One goes northerly from there to the north end of the loop and the other goes southwesterly to the southern end of the loop.

Mr. LEA. And, in an air line, how far would that be north from Lake Pleasant—in an air line to the northern part of the loop?

Mr. WELCH. I think about 5 miles.

Mr. LEA. It circles the mountain?

Mr. WELCH. Yes.

Mr. LEA. And then goes west and south and back to Lake Pleasant?

Mr. WELCH. Yes.

Mr. LEA. Why do you say the Crescent route would be more salable than the extension of the Milwaukee from that end?

Mr. WELCH. Because it would be attractive to other corporations, other interests, and railroad interests.

Mr. LEA. In what way would it be used by the corporations and the railroads?

Mr. WELCH. To land that timber there. To take the product of the logging operations to the border.

Mr. LEA. When were you last out there at this Lake Crescent?

Mr. WELCH. In December, nearly Christmas, I think. The latter part of December.

Mr. LEA. What information have you as to the expense of the slide on the curve on the Crescent route last winter?

Mr. WELCH. I have not any.

Mr. FREAR. Has no information been given you as to the slide that occurred?

Mr. WELCH. No, sir.

Mr. FREAR. Do you know what efforts were made in regard to repairing the curve and the ballasting of the rails?

Mr. WELCH. I haven't seen that figure since I separated from the service.

Mr. FREAR. Now you have informed us of all that you think might be of importance for this committee to know, have you?

Mr. WELCH. I would like to say one thing, that in the construction of those roads out there, and there were a number of them and a lot of difficult problems. Of course take the ones which we determined in our judgment would have further value for salvage purposes after the war was over—those were more carefully constructed and those which we intended to tear up and take out that we were putting in simply as a war measure, and the only ones we put in simply for the purpose of getting out the spruce with the intention of tearing the rails up at the end of the war, we built in some instances on piles—three-pile bents. In others simply cut the hemlock logs down and rolled them in and laid the rails on top.

Mr. FREAR. That is what is ordinarily known as a logging road.

Mr. WELCH. Yes; but those roads that we thought would have a salvage value we built, and they were good roads.

Mr. LEA. How about the cost of this road. Do you know what it cost?

Mr. WELCH. Yes, sir.

Mr. LEA. And what reason was there for that cost, in your judgment?

Mr. WELCH. The principle reason for that cost was the speed with which everything was done. The high-tension conditions under which that work was accomplished. Of course labor was much higher than any railroad construction I have had anything to do with. The transportation problem—rather greater than the ordinary frontier railroads meet, and the contractors were told to do everything just as rapidly as possible and sacrifice everything for speed. I think that accounts for the cost more than anything else.

Mr. MAGEE. There is no proposed purchaser of this Lake Crescent road, except the Milwaukee road, is there?

Mr. WELCH. I think there very likely is. I think there are enough large timber holders in that peninsular to warrant a group paying a fairly good price for that railroad for the purpose of marketing that timber.

Mr. MAGEE. The Government has not received any bids yet, has it?

Mr. WELCH. No.

Mr. MAGEE. Have you any knowledge of it?

Mr. WELCH. No.

Mr. MAGEE. Our understanding is that they have not received any bids?

Mr. WELCH. I did not know that.

Mr. MAGEE. The salvage value of the road is placed on the itemized statement prepared by the Spruce Product Corporation, of February, 1919, at about 8 per cent of cost. That would be a small salvage value, would it not?

Mr. WELCH. I always considered, in my mind, that there was more than \$1,000,000 salvage in that railroad, and I still believe it. That is my opinion.

Mr. MAGEE. It is a matter of simply finding some one to put his money in it?

Mr. WELCH. I think I would.

Mr. MAGEE. Any such purchaser would have had to utilize the St. Paul Railroad and the Joyce Junction?

Mr. WELCH. Yes; I believe that there are other buyers who could afford to give more for it than the St. Paul.

Mr. MAGEE. Now, if the St. Paul Railroad had been extended from Deep Creek, why, of course, there would have been a road, an extension, which the Milwaukee road could have used.

Mr. WELCH. Yes.

Mr. MAGEE. And, of course, the Milwaukee road wanted to get into this timber tract for some time?

Mr. WELCH. Yes, sir.

Mr. MAGEE. I think Mr. Erling, of the road, testified in New York that such an extension, after the war ended, would be worth \$40,000 per mile to the Milwaukee road.

Mr. WELCH. Yes, sir.

Mr. MAGEE. If the extension had been made, as determined upon, there would have been a ready purchaser for it, would there not?

Mr. WELCH. Mr. Erling may say so now, but I have never seen a big railroad company pay \$40,000 a mile for an extension that was at their mercy.

Mr. MAGEE. If they wanted to get into the timber, they would have to pay and give in to the Government?

Mr. WELCH. Yes.

Mr. MAGEE. And their policy was to extend this tract into the timber 1, 2, or 3 miles a year, to meet their timber needs?

Mr. WELCH. Yes, sir.

Mr. MAGEE. And their policy was to extend their line into this timber 1, 2, or 3 miles, as their timber needs warranted?

Mr. WELCH. Yes, sir; but it is my opinion that the Milwaukee road would have and did recognize the fact that the extension was absolutely in their hands.

Mr. FREAR. The Government would not have been bound to sell to them?

Mr. WELCH. Certainly.

Mr. FREAR. If they wanted to get the timber—

Mr. WELCH. Well, they have a lot of timber where they are, and their policy, as I take it, is to keep extending their road a mile more every year. They would not build a whole extension in one

year. They would have built it in different years, as their commercial needs demanded it and required it.

Mr. FREAR. In other words, the Milwaukee road is a logging road. That is the subsidiary road there?

Mr. WELCH. Yes, sir.

Mr. FREAR. And that is the only business there?

Mr. WELCH. Practically.

Mr. FREAR. So that if they had extended, they would have to make a bargain with the Government, if they wished to get in business there?

Mr. WELCH. Yes, sir.

Mr. FREAR. And it is presumed that the Government could have made a reasonable bargain with them?

Mr. WELCH. Yes, sir.

Mr. FREAR. They would even have to go out of business or buy?

Mr. WELCH. No; they could go alongside of it.

Mr. FREAR. But you don't mean that they would build a parallel road rather than buy from the Government?

Mr. WELCH. No; I did not say so.

Mr. FREAR. You don't mean to say that the Milwaukee road would build a parallel road at a large cost rather than pay the Government a reasonable price for the road constructed?

Mr. WELCH. No; but I think they would have offered a very low price, because they would realize that they were in a position to do that.

Mr. FREAR. You do not think that Mr. Erling meant what he testified?

Mr. WELCH. He might have meant it, but I don't think he was making a deal for the Milwaukee Railroad.

Mr. FREAR. He is a very important factor in it?

Mr. WELCH. Yes, sir.

Mr. FREAR. You have 36 miles of road, extending from Lake Joyce to Lake Pleasant, until you reach the spruce region in Lake Pleasant, haven't you?

Mr. WELCH. Yes, sir; and I still believe it is a perfectly salable proposition.

Mr. FREAR. You haven't had any bids, have you?

Mr. WELCH. Has it been put on the market?

Mr. FREAR. Yes; I understand it has been advertised, but no bids have been received. The testimony is to the effect that there isn't any possible purchaser except the Milwaukee road, and the Milwaukee road officials claim that they do not want it because the natural extension of their business is by the extension of their lines gradually in getting out the lumber. I understood them to say that they were not in favor of extending the Milwaukee line, because such an extension would not have as much salvage value to them.

Mr. WELCH. Yes; it would not have as much salvage value as it would if it could be sold to some one else.

Mr. FREAR. The whole proposition of the Lake Pleasant road was a commercial proposition. It was not so much a war measure as a commercial proposition?

Mr. WELCH. No, sir; I believe it was entirely a war measure. I had in mind the saving of money for the Government.

Mr. MAGEE. Is some one utilizing the road and getting out these large amounts of timber after the war.

Mr. WELCH. And getting something for the road in salvage value.

Mr. MAGEE. The only value of that road is that resulting from the fact that the timber is there and that the timber would have to be taken out over the road.

Mr. WELCH. Exactly.

Mr. MAGEE. Now, did you think about the salvage value when you recommended the extension of the Southern Pacific down to Yaquima Bay on the Pacific coast?

Mr. WELCH. Yes, sir; I thought it might some day be a part of that road which would be extended.

Mr. MAGEE. Would extension there have a real salvage value over an independent road?

Mr. WELCH. Well; now, either one of them would be independent. Suppose you extended the Miller road. The Miller road is connected with the Southern Pacific just as much as the other roads. There is only one railroad into that part of the country. Of course, they must depend upon that one as a feeder. It might become a part of the road that extends through along the coast line and that is a dream that a great many people out there have had for many years.

Mr. MAGEE. For commercial purposes up along the coast it would have a value and it would please the people of Toledo up there, would it not?

Mr. WELCH. I do not know.

Mr. MAGEE. It runs up along Newport. Newport wanted the road built?

Mr. WELCH. Yes, sir; they wanted to get it up to Newport.

Mr. MAGEE. It goes through the corporate limits?

Mr. WELCH. At Newport; yes, sir.

Mr. MAGEE. So that they had to get the consent of the Newport authorities to survey the road?

Mr. WELCH. Yes, sir; the road up by Agate Beach and some other summer resorts along the coast. It goes where I think any north and south road goes that is built along the coast as a commercial proposition.

Mr. MAGEE. Certainly, that is what I am saying. Isn't it a fact that you had in mind all along the commercial proposition rather than the immediate war needs?

Mr. WELCH. No, sir; I did not.

Mr. MAGEE. If you had built the Miller road, you would have gone straight up?

Mr. WELCH. I would not have gotten there much quicker.

Mr. MAGEE. You would have gone right up?

Mr. WELCH. I would have gone right up on the hill. I would not have gotten into the timber as easily as I did get in.

Mr. MAGEE. You would have gone over the divide into Siletz Basin, where this heavy spruce was?

Mr. WELCH. Col. Disque, I recall, said that the reason they did not build the road that way was for two reasons: First, because they could not get over the divide; second, because there was not any spruce there.

Mr. MAGEE. Do you concur in that view, Major?

Mr. WELCH. I told you my belief.

Mr. MAGEE. Do you?

Mr. WELCH. I told you you would have to get over the divide. So I can't say. I told you what I considered my reason.

Mr. MAGEE. There is no standard spruce there?

Mr. WELCH. Yes.

Mr. MAGEE. As I recall it, Col. Disque testified that if you could get over the divide and the spruce was there that that was the feasible way of doing it.

Mr. WELCH. I could get my logs to the coast and just tow them.

Mr. MAGEE. Do you mean that you could tow your logs around to Newport down to Clallam Bay and then raft them to Toledo?

Mr. WELCH. Yes, sir.

Mr. MAGEE. You had two terminals, beams, and trussels built there for that purpose?

Mr. WELCH. Yes, sir.

Mr. MAGEE. Now, if you had extended your roads from Toledo up to Siletz Basin you would have gotten spruce every mile of the way up to this large spruce section and then when the logs were loaded in the cars there would be no towing, but they could have been taken directly to Toledo.

Mr. WELCH. They would have been dumped into the dumping grounds at Toledo.

Mr. FREAR. What roads did you build that you thought would have a good salvage value?

Mr. WELCH. The one extending north and south from Yaquina and Clallam Bay and another one.

Mr. FREAR. How long a road is that?

Mr. WELCH. Ten miles.

Mr. FREAR. And what was the average cost per mile there?

Mr. WELCH. I don't remember. We got it finished just about a month before the armistice was signed.

Mr. FREAR. Now, the general understood up there that the Siems-Carey people expected to continue in the lumber and logging business after the war was over. You did not understand that?

Mr. WELCH. I do not know. On the contrary, I understood that Mr. Carey and some of his partners were going to China and build a road.

Mr. FREAR. They had been building a road in China prior to that time. The testimony in the form of a letter from John Ryan was to the effect that that was never concealed and that was their purpose for building a road for subsequent operations. You did not know about that?

Mr. WELCH. I did not know about that.

Mr. FREAR. You did not know that that company had expected to continue operations there after the war was over?

Mr. WELCH. No, sir; I did not have any information on that.

Mr. FREAR. So that you did not know that. All you had in view was the increased salvage value of these railroads, if they had been sold independently after the war was over. Now, the testimony of several loggers is to the effect that this road which was built is not of any special value as a logging road because an effort to get out

this timber in the Pleasant Lake tract would be more economical if you took it north and west from that point rather than to carry it over the 36 or 38 miles along the road built by the Government and then paying \$1 a thousand to get it to Port Angeles. Have you any opinion on that?

Mr. WELCH. I have not, other than I have given. I am not a logger.

Mr. FREAR. Were any terminals decided upon for this Government-built road while you were out there. I think Port Crescent and Port Angeles were investigated with that in view.

Mr. WELCH. Its plans, as I understood, for their operation provided proper rates could be obtained for hauling logs from Joyce to Port Angeles, and I understood that they were made and finally agreed upon that all logs would be dumped into the water at Port Angeles.

Mr. FREAR. Who told you that such an agreement had been made and established?

Mr. WELCH. I could not say. I simply know it as office rumor.

Mr. FREAR. The reason I asked you is that that information had been received by the committee to that effect. Now, what was the purpose, so far as you understood, in fixing the terminals of this Government railroad on the sound and at that place?

Mr. WELCH. It was only to get this spruce out for other purposes and into the market.

Mr. FREAR. Now, at what point?

Mr. WELCH. At Port Angeles. There were three constructions there. Port Crescent, Port Angeles, and Blin.

Mr. FREAR. Where is Blin?

Mr. WELCH. On Discovery Bay.

Mr. FREAR. And it had not been decided, as I understand it, at the time of the armistice, when you were out there?

Mr. WELCH. As I understood we were going to haul them over the Milwaukee, back from Joyce to Port Angeles and put them in there.

Mr. FREAR. And you were not to use the Port Angeles route?

Mr. WELCH. No, it was given up. There was an agreement with the Milwaukee. They had given us a good freight rate from Joyce to Port Angeles and so we went no further with the proposition.

Mr. FREAR. I understood you to say that the freight was a factor in the determination of this matter.

Mr. WELCH. Yes.

Mr. FREAR. At what time did you give up the Crescent Lake proposition?

Mr. WELCH. The last I heard of the Crescent Lake proposition I think was in September.

Mr. FREAR. In September, 1918? That is before the signing of the armistice?

Mr. WELCH. Yes, sir.

Mr. FREAR. Where did you expect to take these logs that you would dump into the water at Port Crescent?

Mr. WELCH. Part of them to Port Angeles at the mill and the other into the mill on the sound where they were to be sawed.

Mr. FREAR. That is, you proposed to raft them the 20 miles or whatever distance it is from Port Crescent to Port Angeles, then to other points along the sound there?

Mr. WELCH. Yes.

Mr. FREAR. That was the purpose in connection with the Port Crescent proposition which you had considered.

Mr. WELCH. Yes, sir.

Mr. FREAR. Mr. Carey testified that when the armistice was signed his intention at that time was to carry them on beyond Port Angeles to a point—

Mr. WELCH (interposing). Blyb?

Mr. FREAR. Sequin Bay was what he called it and that appears to be on the railroad about 80 miles from Lake Pleasant, on Discovery Bay. That was his plan. Do you know anything about that?

Mr. WELCH. I know it was being considered.

Mr. LEA. Why do you consider that the Coast Road north of Yaquina Bay was the best way to reach the spruce in the Siletz Basin?

Mr. WELCH. I covered that very closely.

Mr. FREAR. Do you know that there had been a great deal of discussion on this matter down at Yaquina Bay?

Mr. WELCH. I did not know until some time during last summer.

Mr. FREAR. That was the first you heard of it?

Mr. WELCH. Yes, sir.

Mr. FREAR. Back in November, 1918, a report was furnished to the Intelligence Department on that very point in which this statement appears: "In summing up situation No. 1, which deals with the activities of the Warren Spruce Co., in Oregon, particularly in reference to the Toledo district, it appears that two railroads were built by the Warren Spruce Co. in that locality on cost-plus contracts, and that they were unnecessary. These two roads, which were built on the north side of Yaquina Bay, with a trackage of about 25 miles tap, according to the Timberman's Journal, a copy of which is attached, 620,000,000 feet of spruce. Our informants contend that this land could have been reached by a short extension of the old Miller road, which would have eliminated the necessity of these two branches. Yet, with this large grove of timber on the north side of Yaquina Bay, we find that the Warren Spruce Co. was given another contract to build a road south from the bay which passed for 36 miles through land which contains no spruce and taps the Blodgett track, containing only 220,000,000 feet of spruce. At that time there was considerable discussion of this because they spoke about it here and we have had a number of witnesses before the committee at Portland in reference to the loggers and others in regard to this matter, especially in regard to the Miller road. So you say that the last time you heard of it was this summer?

Mr. WELCH. The summer of 1918.

Mr. FREAR. When these roads were being projected; at that time you heard it?

Mr. WELCH. Yes, sir.

Mr. FREAR. What reason did you have for building that road down to the Blodgett tract?

Mr. WELCH. That was already decided upon.

Mr. FREAR. That was a track 23 or 24 miles long, with, I think, only 250,000,000 feet of spruce and no spruce until the road was completed. You have been down there?

Mr. WELCH. Yes, sir.

Mr. FREAR. No timber until you reach Siletz Bay?

Mr. WELCH. No, sir.

Mr. FREAR. That is a very small proportion of spruce timber for building a line of that length?

Mr. WELCH. I understand that there is a great deal more spruce down there than that.

Mr. FREAR. That is the estimate of the people who sold it to the Government—253,000,000 feet of spruce. In this it is 250,000,000.

Mr. WELCH. Yes.

Mr. FREAR. That was understood before the Blodgett tract was taken over. I believe that the negotiations were under way for a long time but I am not sure of the amount.

Mr. WELCH. I am not sure when the thing was closed.

Mr. FREAR. All you understand is about the railroad, more particularly?

Mr. WELCH. Yes, sir.

Mr. FREAR. There were some terminals built there. Did you have charge of any of that work on Yaquina Bay?

Mr. WELCH. Yes, sir.

Mr. FREAR. And from those terminals, one of them at the north end of the Blodgett land on the south end of Yaquina Bay line, you proposed to raft your logs around to Toledo to the new mill that was being constructed there, some 12 miles; I believe that is what you testified?

Mr. WELCH. Yes, sir.

Mr. FREAR. Instead of hauling them from the north side, from the bay around to Toledo. What was the reason for that?

Mr. WELCH. We could not get a low rate from the railroad, so that was cheaper to raft and log them from Yaquina Bay up to Toledo. We could raft them cheaper than we could haul them up on the Southern Pacific.

Mr. FREAR. Those 10 or 12 miles, in connection with other operations?

Mr. WELCH. Yes, sir.

Mr. MAGEE. You could take them on the road or raft them?

Mr. WELCH. I don't say we could have, in connection with that operation. I am not a logger. You have got to dump them in the water and handle them.

Mr. MAGEE. Col. Disque testified that no arrangement had been made to dump them in. If I remember his testimony, that is what he testified to.

Mr. WELCH. I am not a logger. That was not my understanding. I understood that they were to be handled either by water or land.

Mr. MAGEE. Do you think it a great saving of time to take them back by Agate Beach and over to Newport, and over to Yaquina Bay, and then take them by raft up to Toledo?

Mr. WELCH. It requires quite a little time to handle a car of logs after it was loaded, but not much more for a few miles more.

Mr. MAGEE. At any rate, that is your judgment of efficiency?

Mr. WELCH. Yes, sir.

(The witness was excused.)

ADDITIONAL TESTIMONY OF COL. E. S. GORRELL, UNITED STATES ARMY, WHO HAD BEEN PREVIOUSLY SWORN BY THE COMMITTEE.

Mr. LEA. Col. Gorrell, I wish you would briefly state from what source the linen for the airplanes was derived, and any references that you may wish to make thereto.

Col. GORRELL. The linen for Army airplanes was purchased from the British Government. When we first went into the war, individual dealers in the United States had been buying it from the British Government. This arrangement did not meet with the satisfaction of the British Government and was therefore changed, and thereafter the United States Government bought it direct from the British Government.

Mr. LEA. And what would you say was the source of the supply of linen?

Col. GORRELL. The entire source of the supply of linen was Ireland, and it was controlled by the British Government during the war.

Mr. LEA. Was there any trouble about the linen supply after that?

Col. GORRELL. No, sir; after the arrangement was completed so that our Government bought from the British Government there was no trouble. The supply was always insufficient during the war. But the development of cotton substitutes (by the Bureau of Standards in this country) relieved the situation in that it allowed the cotton substitutes to be used on training planes and certain portions; for instance, the fuselage of certain service airplanes.

Mr. FREAR. Were the cotton substitutes used in connection with linen or were they used alone?

Col. GORRELL. On certain types of service airplanes the substitutes could be used on the sides of the fuselage, while the covering of the wings could be linen.

Mr. FREAR. Is not the fuselage covered in every case with some kind of cloth?

Col. GORRELL. Quite a number are built out of wood—monocoque construction. Some of them are entirely covered with cloth (when built in a rectangular or square shape), at least from near the pilot's seat back, and back of the pilot seat they are covered with cloth. When of a cylindrical shape they are of monocoque construction, which consists of strips of wood, very thin, lapped crisscross, two, three or four layers in thickness, thus giving a very strong construction.

Mr. FREAR. I notice that the fuselage is covered, as a rule, with cloth.

Col. GORRELL. As a rule; yes, sir. The monocoque construction is best if you can get the necessary quality of wood.

Mr. FREAR. What kind of wood?

Col. GORRELL. The three-ply wood we consider the best covering, but this kind we have had great trouble in getting for the machines over there. The British Government reported to us that the supply of this wood and glue came from Russia, and that since Russia was

put out of the war it was very difficult to get them. They asked us—that is, the British Government asked us—to develop in the United States, as early as 1917, some substitute for the three-ply wood, since there was no prospect of obtaining any from Russia.

Mr. FREAR. Was that spruce wood?

Col. GORRELL. I don't know, sir.

Mr. FREAR. Was that a laminating process of the wood?

Col. GORRELL. It is not a laminated proposition. In Europe, instead of 3-ply wood we have had to use substitutes because we could not get 3-ply wood for the fuselage.

Mr. FREAR. Had any other governments undertaken the use of laminated processes for wing beams, that came to the attention of our Government?

Col. GORRELL. I can't think of any case where laminated wood processes were used for wing beams. In the Caudron R-11—in that case the wing beam for both right and left hand planes is a continuous structure—they could not get sufficient strength from the wood alone, so they put a steel core in it. To insert the steel core, they cut the wood in half and then put the steel inside, after which they glue the halves together again and then wrap the beam with linen. This gives a beam far more stronger and rigid than the wood alone. However, that is not a laminated proposition.

Mr. FREAR. It seems that toward the last, the French were using laminated wood processes.

Col. GORRELL. I would not like to be taken as a final authority on that.

Mr. FREAR. I was wondering whether or not a new wood had come to your attention.

Col. GORRELL. No, sir; I had been off of strictly technical work for close on to 20 months.

Mr. LEA. Have you the information here—that is the general information—as the source of the "dope" supply?

Col. GORRELL. I only know that the previous supply, the general source of "dope" supply, was the United States. England was afraid that we would cut off her supply of raw material for making acetate dope and she asked us to utilize a nitrate dope. Nitrate dope is rather apt to catch on fire. England did not care to utilize a nitrate dope and neither did we. Therefore, we had to increase the supply of the materials necessary to make the acetate dope that England had found to be best before we went into the war. It was an inflammable dope.

Mr. LEA. The dope actually used was inflammable to a pretty high degree, was it not?

Col. GORRELL. Yes; there are some grades of dope very inflammable.

Mr. FREAR. What effort was made to avoid that? What was done?

Col. GORRELL. A considerable amount of test work had been carried on by England before we went into the war and Capt. V. E. Clark had done some of this test work with his own force and we were pretty well familiar with the treatment of inflammables such as this. I can't testify to all manufacture, but, as far as I know, I know of no case where dope that might take fire was used to cover the wings of our airplanes.

Mr. FREAR. There has been no testimony before this committee, as far as I can recollect, showing what plants were erected for the manufacture of this dope. Have you any here?

Col. GORRELL. From my own personal knowledge, I do not know, but here is an Air Service paper that will give you the information. This information is as follows:

LIBERTY MOTORS AND PROPER PROPORTION OF SETS OF SPARE PARTS.

It is agreed that the total production of Liberty motors for the purpose of settlement is.....	20, 478
Great Britain has purchased or will take 11 per cent of the total production, or.....	2, 252
It is also agreed that the total cost of Liberty-motor construction for the purpose of this settlement is.....	\$150, 815, 619. 00
Great Britain shall pay 11 per cent, or.....	\$16, 589, 718. 90
Deduct payments to date.....	\$2, 625, 000. 00
Balance due.....	\$13, 964, 718. 90

WAR DEPARTMENT,
London, England, May 10, 1919.

MINISTER OF MUNITIONS FOR GREAT BRITAIN,
Hotel Metropole, London, England.

DEAR SIR: Summary of terms of settlement of claim of United States against Great Britain on items listed below.

The following bills shall be rendered by the Bureau of Aircraft Production of the War Department:

Spruce, fir, and cedar.

Total footage shipped to all nations from beginning of operations to April 18, 1919.....	143, 008, 961
Total invoiced value.....	\$27, 465, 863. 78
Great Britain received 28.98 per cent, or.....	41, 437, 047
Invoices to Great Britain, 34.55 per cent, or.....	\$9, 489, 530. 21
31.765 per cent of total cost of production, including amortization of plants, etc.....	\$14, 225, 292. 00
Add inspection charges.....	\$14, 581. 90
Total.....	\$14, 239, 873. 00
Deduct cash paid on account.....	\$665, 323. 70
Deduct Great Britain's share of liquidation of S. P. O.....	300, 000. 00
Balance due United States.....	\$965, 323. 70
Total.....	\$13, 274, 550. 20
Great Britain has no further interest in the Spruce Production Corporation.	

WOOD DISTILLATES.

United States render a bill to Great Britain which shall include damages resulting from cancellation of:

Commandeering order.....	\$200, 000
Acetone contract.....	61, 981
Methyl alcohol contract.....	50, 000
Also 50 per cent of total loss incurred in construction of 7 wood distillate plants.....	3, 075, 573
Total.....	3, 387, 554
Credit Great Britain equalization of price of acetone obtained from the United States Industrial Chemical Co. and capital adjustments to Chemical Co.....	500, 000
Total due United States.....	2, 887, 554

JUNE 12, 1918.

From: R. J. Trimble, assistant to the special representative of the Secretary of War, Room 3070, Munitions Building.

To: Lieut. S. S. C. Chilcote, Building D, Sixth Street and Missouri Avenue.

Subject: Sales of wood chemicals by this Government to our Allies.

1. The only sale of wood chemicals by this Government to its allies of which I have knowledge is one of 554,400 pounds of acetone, at 25½ cents per pound, amounting to \$141,372. This acetone was the product of the Commercial Solvents Corporation, of Terre Haute, Ind., a joint enterprise of this Government and His Britannic Majesty's Government, and was sold out of the one-half of the total output of that corporation which belongs to this Government.

2. The other sales of wood chemicals to our Allies were made directly by the manufacturers who produced the same under the War Department orders commandeering wood chemicals or under contracts directly with this Government (the case with the United States Industrial Chemical Co., of Baltimore), or under direct contract with the British Government (the case with Hercules Powder Co.), or from the Commercial Solvents Corporation. There was thus sold 17,803,884 pounds of acetone alone to the British Government in 1918; 2,259,788 pounds thereof to the French Government; 4,947,712 to the Italian Government; and 69,440 pounds to the Portuguese Government. In addition, approximately 2,000,000 gallons of methyl alcohol and methyl acetone, and in the neighborhood of 20,000,000 pounds of acetate of lime and other wood distillate products were sold to our Allies in 1918. The aggregate value of all thereof was in excess of \$10,000,000.

In the early part of 1918 this Government entered into a program for the construction of plants as additional sources of supply of wood chemicals, which involved an expenditure of over \$10,000,000. The British Government has shared in the net loss incurred in this construction enterprise.

R. J. TRIMBLE,

Assistant to the Special Representative of the Secretary of War.

Mr. LEA. Col. Gorrell, what efforts were made with reference to the suggestion of the Rolls-Royce engine?

Col. GORRELL. In its European investigations of the allied engines, the Bolling mission did not find any large horsepower engine that impressed it as much as did the Rolls-Royce. In fact, it was the engine that impressed this mission as being highly desirable for manufacture in the United States. We tried to get from England the drawings of the Rolls-Royce engine. The British Government was not in a position to force the Rolls-Royce people to give us the drawings from which to manufacture this engine. I might say that, before the Bolling mission departed for Europe, the Aircraft Production Board tried to get representatives sent to the United States from the Rolls-Royce factory in order to start Rolls-Royce production in the United States. When the Bolling Commission arrived in England, it was found that the British Government could not exert the necessary pressure to get the Rolls-Royce firm to concede to the United States the right to manufacture this engine without the payment of a royalty. The English Government stated to the Bolling Commission that the United States would have to make, direct with the Rolls-Royce firm, such an agreement as could be made, that the Rolls-Royce engine was an extremely difficult manufacturing job—that the manufacture of its parts was very difficult. It was a very fine engine, but very difficult to keep up in the field, and we realized that our production of it could not be very great.

The English Government said that if we would let the Rolls-Royce representatives come to the United States and manufacture these engines as a side issue over and above the regular United States pro-

duction program then the British Government would join the United States Government in utilizing all of the Rolls-Royce engines manufactured in United States. I might say that England was giving priority to her Navy Air Service on Rolls-Royce engines for seaplane work in hunting down the submarines. The English production was expected to be only something like 500 to 800 Rolls-Royce engines during the coming 12 months.

The Bolling mission did actually recommend to the United States the production of the Rolls-Royce engine in this country. That recommendation was cabled from Italy, probably July 19 or 20, 1917. I inquired later on why the Rolls-Royce engine was not manufactured in the United States, and Col. Waldon, upon his arrival in Europe in the latter part of 1917, told me that after many attempts to get the Rolls-Royce representatives to manufacture these engines in the United States, the United States was informed by the Rolls-Royce people that the cost to the Government would be extremely high and the production would be extremely low. He stated that, in the delay which took place in trying to get the Rolls-Royce people satisfied and willing to go ahead, the Liberty engine had progressed to such a stage as to make it certain of success—for, at a cheaper price, they could obtain a much greater production of Liberty engines with a horsepower slightly higher and a weight slightly less than the Rolls-Royce. The Liberty engine therefore gave greater promise. There were fewer parts to it, therefore making the engine simpler of manufacture and increasing the production materially.

Mr. LEA. Have you any information showing the comparative number of parts between the Rolls-Royce engine and the Liberty engine?

Col. GORRELL. The Rolls-Royce has about 200 more parts than the Liberty engine. The Rolls-Royce engine is full of little nuts and very fine things, all of which are hand-made to a very great degree in England. Here is a paper that I got in the air service—

Mr. FREAR. I find here from Capt. Seaton a statement which I believe should be inserted in connection with the letter of June 12, which has given full and general information regarding the dope of which you are testifying. It contains our settlement with Great Britain on spruce and fir, on the dope, as it is called, and on the engines, and it makes a rather complete statement along that line. This appears to be a statement of the overseas liquidation with Great Britain.

Col. GORRELL. This specific information shows that the price asked for the manufacture in the United States of the Rolls-Royce engine would be somewhere between \$10,000 and \$10,500 per engine, and that the production promised up to July 1, 1918, was only 500 engines. That is the promised production. Now, sir, when the Bolling mission was sent to Europe it was instructed to pick engines as well as airplanes for manufacture in this country. Just before the Bolling mission left the United States there was a meeting in the office of the Chief Signal Officer, in July, 1917. It was an informal meeting of the Aircraft Production Board and the Army members of the joint Army and Navy Technical Board. The proposed drawings of the Liberty engine were shown and examined and the designers of the Liberty engine were instructed to go ahead. They were told to go ahead and push their designs, and it was de-

cided to build an engine or two for experimental purposes—to see how it would work. We had previously seen in this country the attempt of the Wright-Martin firm—previously the Simplex—to build a foreign engine—the Hispano-Suiza. That had been attended with failure for more than a year.

Mr. LEA. That was built for whom?

Col. GORRELL. For the French Government. It had been a failure for more than a year and they had French mechanics there helping them to make it a success. Also, we knew that foreign nations had attempted to build each other's engines and had failed. Consequently, we visualized what had been done on foreign engines in this and other countries and that it was possible that we might fail in the production of foreign engines as well. In the Liberty engine we saw a good possibility and knew that it would not do us any harm to carry on experimental work and if it did do us any good we would be just that much ahead. It was for that reason that "go ahead" was given the Liberty engine designers, and they went ahead.

Mr. LEA. Do you have the date that the Liberty engine was tested?

Col. GORRELL. The exact date I do not know, but there was a cablegram sent to the A. E. F. telling us it was tested in July, 1917. My recollection is that it was tested at the Bureau of Standards. That, of course, was the first of quite a number of tests.

Now, sir, here is a tabulation of the relative weight of the Rolls-Royce and Liberty engines. This is in answer to the questions that you asked a while ago.

Mr. LEA. There were several different designs of the Rolls-Royce engines, were there not?

Col. GORRELL. It shows that the Liberty engine had a weight of 2.27 pounds per horsepower, while the Eagle Rolls-Royce engine had a weight of 2.42 pounds per horsepower.

Mr. LEA. What do these various numbers on Eagle Rolls-Royce represent?

Col. GORRELL. They represent different types of the Rolls-Royce engine.

Mr. LEA. Was that the evolution of the engine?

Col. GORRELL. Yes, sir; so that the Rolls-Royce Eagle should be the final word—375 horsepower.

Mr. LEA. That is the largest size Rolls-Royce?

Col. GORRELL. Yes, sir. Here are records showing that the first Liberty 8-cylinder motor was set up and tested on July 4, 1917, at the Bureau of Standards, and the first 12-cylinder Liberty motor was built and successfully passed its 50-hour test on August 25, 1917.

Mr. LEA. Will you state where?

Col. GORRELL. For the 12 cylinder—it is not stated.

Mr. LEA. Well, did any American engineer pass upon the question of the practicability of the production in quantities of the Rolls-Royce engine in this country?

Col. GORRELL. Yes; in Europe the motor engineers of the Bolling mission passed upon that question and arrived at the same conclusion that the British arrived at, as also did the Rolls-Royce

people in submitting their estimate of 500 that they would be able to produce by July 1, 1918.

Mr. LEA. Do you know the number of Liberty engines that were produced before July 1, 1918?

Col. GORRELL. I can get that. Furthermore, you must realize, sir, that the production of Rolls-Royce engines could not increase very rapidly. The production of the Liberty engines could. In fact, the Rolls-Royce engine was such a fine piece of machinery—it was a hand-made job rather than a machine job.

Mr. LEA. Were the Allies consulted in regard to adopting the Liberty engine in proceeding in its manufacture?

Col. GORRELL. The Allies were consulted as to the advisability in regard to experiment, but I do not know of any agreement with the Allies that we would produce it.

Mr. LEA. After the Liberty engine was developed, what did the Allies do in regard to the purchase or the approval of this?

Col. GORRELL. The Allies bought many of them, and England got ahead by placing orders when the engine was in the experimental stage and increasing her orders when the experimental stage was passed.

Mr. LEA. Do you know what date England placed orders for the first Liberty engines?

Col. GORRELL. I can't recall the first contract for them, but England was contemplating orders and requested the right to buy the engines as early as the summer of 1917.

Mr. LEA. What was the opinion of allied engineers as to the Liberty engine as it finally was perfected?

Col. GORRELL. The opinion of the allied engineers was that the engine was a success, and the expression of the British Government, through its ambassador to the United States, was that the Liberty engine was as good, if not better, than the Rolls-Royce engine.

Mr. LEA. Can you tell me the number of different types of airplanes that were used on the front during the war?

Col. GORRELL. Yes, sir; I think I can. As to pursuit airplanes, there were developed by the British, 27 types; by the French, 31 types; by the Italians, 13 types; by the Germans, 12 types. As to two-place pusuit airplanes there were developed by the British, 5 types; by the French, 10 types; by the Italians, 1 type; by Germany, 3 types.

Mr. MAGEE. Did the United States make any?

Col. GORRELL. No, sir; the United States failed in the attempt to obtain the Bristol fighter—it is a two-place fighter.

As to observation airplanes developed, England, 20 types; France, 22 types; Italy, 11 types; Germany, 10 types.

Mr. LEA. Now, in speaking of 20 types of machines, were some of those types evolutions of the same machines?

Col. GORRELL. Yes, sir; when I say the British used 20 types—for example, there were 3 types of DH airplanes, namely the DH-4, DH-9, and DH-9A.

Mr. LEA. The United States did not have any?

Col. GORRELL. The United States had the DH-4s which reaches the front. That was a DH-4 with a Liberty engine. It was a copy of one of the British 20 types.

Mr. LEA. But that was the only type that America manufactured.

Col. GORRELL. Yes, sir; that ever reached the front.

As to the day bombers, the British developed 10 types; French, 7 types; Italians, 4 types. I have no figures on the Germans.

Mr. LEA. Did the United States develop anything?

Col. GORRELL. These DH-4's were recommended both for reconnaissance and for bombing.

Mr. LEA. The DH-4 was the sole one that reached the front?

Col. GORRELL. Yes, sir. The Germans did not engage in day bombing.

Mr. LEA. What sort of bombs did the DH-4 carry?

Col. GORRELL. Toward the latter part of the war it was possible to carry something like—you may say—220 pounds of bombs on a DH-4 airplane. As to night bombers, the British developed 10 types; the French, 4 types; the Italians, 7 types; the Germans, 6 types.

Mr. MAGEE. Did the United States develop any?

Col. GORRELL. No, sir; the United States was engaged in manufacturing a Handley-Page. The United States developed what was called the Martin bomber, but the Martin bomber did not reach the front.

Mr. LEA. Were there changes in the Allied air programs as the war progressed—that is, generally speaking?

Col. GORRELL. Each nation changed its program rather frequently. They all went to war with very small programs and as the war progressed the program was changed. The change in program was, to a great extent, controlled by the ability to produce, and, as a rule, each nation was allowed to produce for the front its maximum output of airplanes. The French changed their program 18 times in the first three years of the war. I can give you the dates and the various changes if you wish. From the Air Service Record it shows that the first British contract for Liberty engines was placed on February 27, 1918, when Brig. Gen. Cormack requested delivery of 3,000 Liberty motors to insure the development of the program of the Rolls-Royce air program.

One contract was entered into with the British for 980 Liberty engines. On May 7, 1918, Gen. Cormack reported the first success of the Liberty motor in a British DH. I gave this information in answering the question asked me about five minutes ago. In answer to the question in regard to airplane production in the United States, I would like to say that on page 504 of the printed record there is a complete tabulation of the Bureau of Aircraft Production—statements from factories of all types of airplane engines for the United States Army during the 11 years from 1908 to 1918, inclusive. Also airplane engines produced by France, England, and Italy for the American Expeditionary Force. This Air Service record does not show the informal negotiations by allied Governments for Liberty engines. These took place in 1917. There was a very great demand for these engines by British during the experimental stage of the Liberty engine, and at a period when Col. Bolling was in charge of the production program of the Air Service of the American Expeditionary Force and cabled allied requisitions for aircraft material

to the United States. Col. Bolling was not holding that position on the date of February 27, 1918, which is the date shown upon the Air Service record as that when the first British formal contract was made.

Mr. LEA. In that connection, when did Col. Bolling die?

Col. GORRELL. He was killed on March 26, 1918.

Mr. LEA. I wish you would tell us the circumstances of his death.

Col. GORRELL. The circumstances of the death of Col. Bolling can be told only from a sworn statement given by his chauffeur. Col. Bolling was on the British front learning the question of the operation of an air force, the idea being that later on he would be designated to be the officer in charge of the American air force which it was contemplated to send to the British front. On March 21, 1918, the German launched his attack which broke through the allied line in the direction of Amiens. The Americans had several squadrons on the British front at that time, and these squadrons were divided into flights located at various British airdromes, learning the work of the mechanical personnel of an aero squadron on the front. There were, in all, some 10 or 12 of these flights. One of these was on an airdrome close to where the German break-through occurred, and apparently Col. Bolling made up his mind to see if he could do anything to get that flight safely out of the German advance. On the morning of the 26th of March, 1918, he got into his automobile and drove along the highway running directly eastward from Amiens. The chauffeur states that they were informed by allied officers that the road was clear for several miles ahead, but that, soon after receiving this information and while driving on the road, they were fired upon by machine-gun fire. As soon as the firing occurred they attempted to turn the car around, but, while getting it turned, a bullet struck the engine and put it out of commission. Col. Bolling ordered the chauffeur to jump into a shell hole and then Col. Bolling jumped into another shell hole. The chauffeur said he could see Col. Bolling from his shell hole. After a short time, when the German machine-gun fire ceased, some German officers approached the shell holes. One German officer fired at the chauffeur and missed him. Col. Bolling fired at the German officer and killed him, but the German's companion fired at Col. Bolling and killed Col. Bolling. The chauffeur was a prisoner until after the armistice. Upon his return to our forces he made a sworn statement to the above.

Mr. LEA. Can you give us the number of American-built machines available for front use on the day of the armistice—the total number?

Col. GORRELL. Yes; I think I can. I have that down in writing and in tabulated form, and can enter it into the record. There is one small point I wish to raise. In all of our tabulations and in all of our records we have used the figure of 213 as being the number of DH4's on our front. That was furnished us by telegram from our front at the time of the armistice. A short time ago the same office that furnished the figure of 213 said that 196 was correct instead of 213, as had been previously given to us.

I have here a tabulation of the number of American-built airplanes available for use on the front on November 11, 1918:

Number of American-built airplanes available for use on front on Nov. 11, 1918.

On front, Nov. 11, 1918.....	196
In zone of advance depots on Nov. 11, 1918:	
Advanced air depot.....	24
Fifth air depot.....	41
First air depot.....	64
Subtotal in zone of advance air depots.....	129
Total in zone of advance.....	325
In Service of Supply air depots:	
Orly air depot.....	25
Romorantin air depot.....	178
Total in Service of Supply air depots.....	203
Total DH-4 airplanes in American Expeditionary Forces available for use on front Nov. 11, 1918.....	528
Being used to give finishing training at American Expeditionary Forces flying schools.....	270
Total DH-4 airplanes available for use in American Expeditionary Forces on Nov. 11, 1918.....	798

Mr. LEA. Who was in charge of that office?

Col. GORRELL. Gen. Mitchell's office. I want to state I here put down the 196 instead of 213 American DH-4's for November 11, 1918. There were a total of 528 American DH-4's on November 11, 1918, available for use on the front.

Mr. MAGEE. Does that include the 196?

Col. GORRELL. Yes. Also, you may take a total of 798 available for any kind of use in the American Expeditionary Forces on November 11, 1918. Of that number there were being used to give finishing training at American Expeditionary Forces' flying schools, 270.

Mr. MAGEE. Where are those schools?

Col. GORRELL. Issoudun, Clermont-Ferrand, Tours, Chatillion—

Mr. LEA. Now, what is the relation of the machines actually in use to those that are available for use behind the lines?

Col. GORRELL. On November 11, 1918, of the American-built machines, there were 196 actually in use, and in the air depots of the zone of advance directly behind our lines there were 129 others. In the depots in the Service of Supply there were 203 others. I have also this tabulation, as follows:

Total number of American-owned airplanes available for use on front on Nov. 11, 1918.

On front, Nov. 11, 1918.....	740
Advanced air depots.....	27
Fifth air depot.....	80
First air depot.....	158
In zone of advance air depots.....	265
Total in zone of advance.....	1,005
Orly air depot.....	391
Romorantin air depot.....	224
In Service of Supply air depots.....	615
Total service type airplanes on hand in American Expeditionary Forces and available for use on front on Nov. 11, 1918.....	1,620

Mr. LEA. Can you get a total number of American-owned machines in use on the day of the armistice?

Col. GORRELL. There were 1,005 American-owned machines available for use and in the zone of advance on November 11, 1918, of which 740 were actually on the front and 265 were in the air depots of the zone of advance. In the rear of those in the air depots of the S. O. S. there were 615, giving a total of 1,620 service-type airplanes in the American Expeditionary Forces and available for service on November 11, 1918. That includes the DH-4's and French and British made airplanes. This is as follows for the zone of advance:

Airplanes in zone of advance, American Expeditionary Forces, available for front as of Nov. 11, 1918.

Types.	Advance air depot.	Fifth air depot.	First air depot.	Squadrons on front.	Total.
A. R. 2.....			25		25
Breguet A-2.....				43	43
DH-4's.....	24	41	64	196	325
F. E. 2-B.....			14		14
Salmson 2 A-2.....		6	39	157	202
Spad.....	2	30	16	328	376
S. E.-5.....		1		4	5
Sopwith Camels.....	1	2		12	15
	27	80	158	740	1,005

Recapitulation.

With squadrons on front.....	740
In advance air depot (Behone).....	27
In fifth air depot (Vinets).....	80
In first air depot (Colombey-les-Belles).....	158

Total airplanes available in zone of advance..... 1,005

Col. GORRELL (continuing). We have no figures in our service records to show the total number of airplanes in the air depots of our allies. The front-line figures have been given to you by Gen. Patrick, who gave the division of airplanes on the front divided according to countries.

Mr. LEA. At what date?

Col. GORRELL. November 11, 1918. After subdividing that a little further to give you the different types—

Mr. LEA. Showing the different kinds of machines that the Americans had?

Col. GORRELL. Yes; this now shows the total number of airplanes in our squadrons on the front of the American Expeditionary Forces on November 11, 1918.

American-owned airplanes on hand in squadrons on front, as of Nov. 11, 1918.

FIRST ARMY.

	Spads.	Salm- sons.	DH-4's.	Bre- guets.	Sopwith Camels.	S. E. 5's.
First pursuit group headquarters.....			1		1	
Twenty-seventh Squadron.....	22					
Ninety-fourth Squadron.....	23					
Ninety-fifth Squadron.....	23					
One hundred and forty-seventh Squadron..	24					
One hundred and eighty-fifth Squadron.....					11	
Thirteenth Squadron.....	23					
Twenty-second Squadron.....	21					
Forty-ninth Squadron.....	22					
One hundred and thirty-ninth Squadron.....	22					
Twenty-eighth Squadron.....	22					
Ninety-third Squadron.....	24					
One hundred and third Squadron.....	22					
Two hundred and thirteenth Squadron.....	22					
First day-bombing group headquarters.....			2			
Eleventh Squadron.....			18			
Twentieth Squadron.....			19			
Ninety-sixth Squadron.....				24		
One hundred and sixty-sixth Squadron.....			21			
Ninth Squadron.....				17		
Twenty-fourth Squadron.....		22	1			
Ninety-first Squadron.....	2	20	2			
One hundred and eighty-sixth Squadron..		15				
First Squadron.....		12		2		
Twelfth Squadron.....		15				
Fiftieth Squadron.....			16			
Eighty-eighth Squadron.....		16				
Ninetieth Squadron.....		12				
Ninety-ninth Aero Squadron.....		16				
One hundred and fourth Aero Squadron....		9				
Total (544).....	272	137	80	43	12	

SECOND ARMY.

Seventeenth Squadron.....	11					
Twenty-fifth Squadron.....						4
One hundred and forty-first Squadron.....	22					
One hundred and forty-eighth Squadron.....	10					
Fifth pursuit group Forty-first Squadron..	13					
Eighty-fifth Squadron.....			11			
One hundredth Squadron.....			17			
One hundred and sixty-third Squadron.....			18			
One hundred and thirty-fifth Squadron.....			21			
One hundred and sixty-eighth Squadron.....			15			
Eighth Squadron.....			17			
Three hundred and fifty-fourth Squadron.....			17			
Two hundred and fifty-eighth Squadron.....		20				
Total (196).....	56	20	116			4

Grand total First army..... 544

Grand total Second army..... 196

Total airplanes in First and Second armies (Nov. 11, 1918)..... 740

Mr. LEA. Do those figures show the total number of the American machines received by the American Expeditionary Forces up to and until November 11, 1918? Isn't there anything to show the total number received?

Col. GORRELL. DH-4's—

Mr. LEA. I mean the total number received.

Col. GORRELL. The total number of all types delivered to our American Expeditionary Forces up to November 11, 1918, was 6,287.

Total number of airplanes delivered to American Expeditionary Forces from all sources up to Nov. 11, 1918.

From French (see p. 489 of this record)	4, 791
From British (see p. 489 of this record)	261
From Italians (see p. 489 of this record)	19
From United States:	
DH-4 airplanes	1, 213
Le Pere experimental	2
DH-9 experimental	1

Total airplanes received by American Expeditionary Forces to include Nov. 11, 1918. 6, 287

Mr. LEA. And were any delivered subsequent to the armistice?

Col. GORRELL. From 300 to 400 were delivered subsequent to the armistice.

Mr. LEA. These were carried on contracts?

Col. GORRELL. Yes, sir. Here is a chart that takes the American-built machines and shows you in detail what became of each and all of them. This first chart shows 1,213 such machines received to November 11, 1918, and a total of 1,440 so received. In the column of those received up to November 11, 1918, at the front there were 628 sent to our zone of advance—I have divided up the 628 to show what became of all of them after reaching the zone of advance. These tabulations are as follows:

De Haviland 4 plane dispatch summary and accounting of planes received from United States.

[A. S. P. C. 2.]

	Total to Nov. 11, 1918.	Total to Feb. 12, 1919.
Zone of advance:		
First air depot, Colombey-les-Belles	410	440
Fourth air depot	83	83
Fifth air depot, Vinets	135	134
Clamecy-Gievres		11
Total	628	668
To schools:		
Orly section fabrications aeronautics	2	2
Orly for shipment to England	36	37
First A. I. C., Paris	9	9
Second, A. I. C., Tours	18	28
Third, A. I. C., Issoudun	158	178
Seventh A. I. C., Clermont-Ferrand	46	57
Aerial Gunnery School, St. Jean-des-Monts	61	75
Second aero school, Chatillon	22	43
Second A. O. S., Souge	3	10
Instruction, A. S. P. C., No. 2	1	1
Chaumont		1
Coetquidan		1
Total	356	442
Total delivered	984	1, 110
Crashed during flight test and en route to delivery points	59	75
Disassembled for spare parts	44	43
Ready for delivery	67	32
In process of assembly	55	
In cases as received from United States	4	180
Total planes received from United States	1, 213	1, 440

Source of information: Salvage and Repair Division, Supply Section.

Explanation of how the 624 DH-4 airplanes sent to the front were utilized.

In use on Nov. 11, 1918, in 2 Army observation squadrons.....	33
In use on Nov. 11, 1918, in 5 day bombardment squadrons.....	93
In use on Nov. 11, 1918, in 5 corps observation squadrons.....	86
Total	212
Attached on Nov. 11, 1918, to a pursuit squadron.....	1
With 12 American squadrons on front on Nov. 11, 1918	213
DH-4 lost over lines.....	37
Crashed at front.....	249
DH-4 airplanes that actually reached the squadrons on the battle front ...	499
In zone of advance air depots.....	129
DH-4 airplanes delivered to the zone of advance	628

Mr. LEA. Were any Liberty engines delivered to the Allies after the signing of the armistice?

Col. GORRELL. There were, six, and that is set forth already in the testimony in great detail, and is contained in a letter written by Gen. Patrick to Mr. Frear, correcting and finishing his testimony of August 4, 1919.

WAR DEPARTMENT,
OFFICE OF THE DIRECTOR OF AIR SERVICE,
Washington, October 30, 1919.

HON. JAMES FREAR,
Chairman Subcommittee No. 1 of Select Committee
On Expenditures in the War Department,
House of Representatives, Washington, D. C.

MY DEAR MR. FREAR: On August 4, 1919, when I testified before your committee, I understood that I should have an opportunity to read over, to correct, and to complete my testimony. I find, however, it has been printed and appears on pages 163 to 233, inclusive, of your hearings.

Since there are certain errors in this printed testimony and since it was contemplated that I should furnish you additional information, I have the honor to request that corrections and additions be made in accordance with what follows.

I am sure that your committee is equally desirous of having its record correct, but I am uncertain whether this can better be done by making changes in the printed copy or by inserting this letter at some place in the record. If the latter course be followed, reference to it should be made in appropriate places. I request that you will have these changes made in some way or other as may seem best to you.

Page 164, paragraph 5, should read:

"Col. PATRICK. Yes, sir. At that time the Air Service was almost a negligible quantity. We had only four American squadrons operating on the western front, viz, First Corps Observation Squadron, using A. R. and Spad 11; Twelfth Corps Observation Squadron, using A. R. airplanes; Ninety-fourth Pursuit Squadron, using Spad 13 airplanes; Ninety-fifth Pursuit Squadron, using the Nieuport 28."

Page 165, paragraph 1, should read:

"Col PATRICK. These squadrons were on the front and were equipped as follows: First Corps Observation Squadron, using A. R. and Spad 11; Twelfth Corps Observation Squadron, using A. R. airplanes; Ninety-fourth Pursuit Squadron, using Spad 13 airplanes; Ninety-fifth Pursuit Squadron, using the Nieuport 28."

Page 167, fifth paragraph from bottom, line 1, change "1st of July" to read "30th of July."

Page 168, paragraph 8, line 3, change "1,660 planes" to read "1,664 airplanes."

Page 168, last line, change "104" to read "105."

Page 169, sixth line. I here promised to furnish to your committee the tabulations from which I quoted to give you the strength of the allied and enemy air forces on the western front. These tables were four in number and are as follows:

Comparison of airplane strengths of allied and enemy air services July 30, 1918.

Type.	Brit- ish.	French.	Ameri- can.	Italian.	Bel- gian.	Ger- man.	Aus- trian.	Com- bined Allies.	Com- bined enemy.
Pursuit.....	911	945	126	282	45	1,080	450	2,309	1,530
Observation.....	390	1,440	126	277	105	1,290	200	2,338	1,490
Day bombardment.....	194	225	18	8	.....	.....	.....	445	.....
Night bombardment.....	169	210	.....	47	10	222	67	436	289
Total airplanes.....	1,664	2,820	270	614	160	2,592	717	5,528	3,309

Figures for British obtained from British General Headquarters, July 30, 1918.
 Figures for French obtained from French General Headquarters, July 30, 1918.
 Figures for American obtained from American General Headquarters, July 30, 1918.
 Figures for Italian obtained from Italian Mission, General Headquarters, American Expeditionary Forces, Sept. 3, 1918 (correct to include July 30, 1918).
 Figures for Belgian obtained from Belgium General Headquarters, Aug. 24, 1918.
 Figures for German obtained from French Bulletin of Aerial Information, No. 20, July 15, 1918.
 Figures for Austrian obtained from Italian Mission, General Headquarters, American Expeditionary Forces, Sept. 3, 1918.

Comparison of airplane strengths of allied and enemy air services Nov. 11, 1918.

Type.	Brit- ish.	French.	Ameri- can.	Italian.	Bel- gian.	Ger- man.	Aus- trian.	Com- bined Allies.	Com- bined enemy.
Pursuit.....	759	1,344	330	336	45	1,020	220	2,814	1,240
Observation.....	503	1,505	293	360	100	1,442	391	2,761	1,833
Day bombardment.....	306	225	117	36	.....	.....	.....	684	.....
Night bombardment.....	190	247	.....	80	8	268	11	525	279
Total airplanes.....	1,758	3,321	740	812	153	2,730	622	6,784	3,352

Figures for British obtained from British General Headquarters, Nov. 11, 1918.
 Figures for French obtained from French General Headquarters, Nov. 11, 1918.
 Figures for American obtained from C. A. S., American Expeditionary Forces, Nov. 11, 1918.
 Figures for Italian obtained from Italian General Headquarters, Nov. 4, 1918.
 Figures for Belgian obtained from Belgian General Headquarters, Nov. 11, 1918.
 Figures for German obtained from G-2, General Headquarters, American Expeditionary Force, Nov. 11, 1918.
 Figures for Austrian obtained from Italian Peace Delegation, Oct. 1, 1918.

Comparison of balloon strengths of allied and enemy air services, July 30, 1918.

Italian front:		
Italian.....	.....	35
Austrian.....	.....	25
Western front:		
Belgian.....	.....	6
American.....	.....	8
British.....	.....	42
French.....	.....	73
Total allied.....	.....	129
German.....	.....	170
Combined allied.....	.....	164
Combined enemy.....	.....	195

Figures for British obtained from British G. H. Q., July 30, 1918.
 Figures for French obtained from French G. H. Q., July 30, 1918.
 Figures for American obtained from American G. H. Q., July 30, 1918.
 Figures for Italian obtained from Italian Mission, G. H. Q., A. E. F., September 3, 1918.
 Figures for Belgian obtained from Belgian G. H. G., August 24, 1918.
 Figures for German obtained from French Bulletin of Aerial Infantry No. 20, July 15, 1918.
 Figures for Austrian obtained from Italian Mission, G. H. Q.-A. E. F., September 3, 1918.

Comparison of balloon strengths of all allied and enemy air services November 11, 1918.

Italian front:	
Italian -----	32
Austrian -----	26
<hr/>	
Western front:	
Belgian -----	6
American -----	23
British -----	43
French -----	72
<hr/>	
Total allied -----	144
German -----	170
Combined allied -----	176
Combined enemy -----	196

Figures for Italian obtained from Italian general headquarters, November 4, 1918.

Figures for Austrian obtained from Italian peace delegation, October 1, 1918.

Figures for Belgian obtained from Belgian general headquarters, November 11, 1918.

Figures for American obtained from Chief of Air Service, American Expeditionary Forces, November 11, 1918.

Figures for British obtained from British general headquarters, November 11, 1918.

Figures for French obtained from French general headquarters, November 11, 1918.

Figures for German obtained from G-2, general headquarters, American Expeditionary Forces, November 11, 1918.

Page 170, first tabulation thereon, column 2, change "40 Belgium pursuit airplanes" to read "45 Belgium pursuit airplanes."

Page 171, paragraph 16, line 3, change "275 balloons" to read "265 balloons."

Page 171, paragraph 22, line 3, change words "in operation" to read "assigned to armies."

Page 171, tenth line from bottom, change word "operating" to read "assigned to armies."

Page 172, eighth paragraph from bottom, should read:

"Col. PATRICK. A balloon company contains 8 officers, 170 soldiers, and 4 soldiers of the Medical Corps, making a total aggregate of 182 persons with each balloon company. They have to carry it around by hand, maneuver it by hand. It takes a large number of men to keep a balloon going and each balloon company usually has one balloon for service and, during our operations on the front, at a time when our balloons were subjected to the possibility of being burned, an extra balloon was carried. Extra balloons were kept at a safe distance back of the lines. They were, however, so close that they could be secured when needed."

Page 173, paragraph 9, should read:

"Col. PATRICK. It required three months to train a balloon observer in the American Expeditionary Forces for service at the front. It would require one year for the same training under peace time conditions."

Page 175, paragraph 8, should read:

"On October 18, 1917, the Dayton Wright Co. was ordered to proceed with the manufacture of DH-4 airplanes."

Page 175, paragraph 14, should read:

"Col. PATRICK. No, sir; that is not true."

Page 176, paragraph 3, It may be stated that the consumption of gasoline by the Liberty Engine in the DH-4 airplane is 0.54 pounds horsepower per hour, or 29.6 gallons per hour.

Page 176, paragraph 6, should read:

"Col. GORRELL. I was in G-3, General Headquarters."

Page 176, paragraph 12, line 3, change the word "balloons" to "planes."

Page 177, paragraph 6, strike out "Col. Patrick" and substitute "Col. Gorrell."

Page 179, paragraph 9, should read:

"Col. PATRICK. We lost 233 airplanes with American squadrons on the front and 57 airplanes by American officers serving with British, French, and Italian

air forces, making a total of 290 airplanes lost by Americans due to action on the part of the enemy. Also 47 balloons were lost due to action on the part of the enemy, and one balloon was blown over the lines, making a total of 48 balloons lost by the American Expeditionary Forces due to action on the part of the enemy."

Page 179, paragraph 17, should read:

"Col. PATRICK. 14.15 per cent of the total airplanes lost in fighting by American squadrons were DH-4 losses; 11.38 per cent of the total airplane losses in fighting, including those airplanes lost by American officers attached to French, British, and Italian air forces, were DH-4 losses."

Page 180, paragraph beginning on line 4 should read:

"Col. PATRICK. Two hundred and thirteen were with our air forces in use at the front. That came out of the total of 667 that had been sent to the zone of the advance. This 667 may be divided as follows:

In use	213
Lost over lines in fighting	33
In store ready for use	325
Crashed by ferry pilots, or in accidents or otherwise	96

Total 667

Page 181, line 1, strike out "Briguet" and insert "Breguet."

Page 185, paragraph 3, should read:

"Col. PATRICK. Yes, sir; all. Then they had in England about 60 men for every plane that they had at the front, making a total of something like 80 men which were required for every plane that was placed at the front. I estimated that our own service, as we were doing a considerable amount of repair work and also doing assembly work in France, would need from 35 to 40 men for every plane that we placed at the front."

Page 186, paragraph 4, should read:

"Col. PATRICK. Yes, sir; I had endeavored to get them," etc.

Page 186, paragraph 5, line 1, change "2331" to "3321."

Page 187, eleventh paragraph from bottom, line 2: Strike out "Briguet" and substitute "Breguet."

Page 188, paragraph 15, line 2, change "Monoscopue" to read "Monosou-pape."

Page 188, sixth paragraph from bottom, change "Paige" to "Page." Strike out the last sentence which reads "We got some parts of it from England."

Page 189, tenth paragraph from bottom: The tabulation herewith authorized is as follows. It is a statement of the number of flying and nonflying officers in the American Expeditionary Forces:

Date.	Flying officers.	Nonflying officers.	Balloon flyers.	Cadets.
1918.				
Apr. 1.....	991	1,642	105	1,409
May 1.....	1,606	1,756	111	1,268
June 1.....	1,737	1,504	118	942
June 15.....	2,031	2,184	119	75
July 1.....	2,290	1,967	117	43
July 15.....	2,408	2,035	118	19
Aug. 1.....	2,515	2,276	177	13
Aug. 15.....	2,658	2,398	180	14
Sept. 1.....	2,877	2,497	183	14
Sept. 15.....	3,112	2,710	181	13
Oct. 1.....	3,269	2,746	181	11
Nov. 1.....	4,077	2,894	175	11
Nov. 15.....	4,088	2,895	219	11
Dec. 1.....	4,032	3,096	207	11
Dec. 15.....	3,760	2,320	209	10
1919.				
Jan. 1.....	3,561	2,106	204	8
Jan. 15.....	3,299	2,024	175	8
Feb. 1.....	2,834	1,832	158	8
Feb. 15.....	1,876	1,599	151	8
Mar. 1.....	1,748	1,435	146	8
Mar. 15.....	1,278	1,366	128	8
Apr. 1.....	1,085	1,267	122	8
Apr. 15.....	1,094	1,041	100	4
May 1.....	972	948	53	.....

Page 189, last paragraph, should read :

"Col. PATRICK. On the line we had a combatant strength on November 11 of about 1,172,000. This is the total number of rifles we had actually in action at any one time. I hope this is understood. The total number of Americans in the American Expeditionary Forces was a trifle over 2,000,000.

Page 190, paragraph 6, first sentence, should read: "Col. PATRICK. Counting rifle strength; that is right."

Page 199, change last word of second italics, second line, from "Gorrell" to "Farwell."

Page 206, paragraph 4, should read: "Col. PATRICK. Yes; a million and a quarter in round numbers."

Page 207, paragraph 8, line 3, second word, change "bombing" to read "pursuit."

Page 207, seventh paragraph from bottom, should read: "Col. PATRICK. I was promoted to brigadier general * * * chief engineer of the lines of communication. I was charged with all of the construction work in France. I remained in that capacity until I was made chief of the Air Service in May, 1918."

Page 208, paragraph 16. I did not have with me the figures comparing deaths in the American service with deaths in allied services; however, this information has been furnished to your committee on October 10, 1919. If you have not received it, or wish further information thereon, please consult Col. E. S. Gorrell, Air Service. On this same page in the ninth paragraph from the bottom of the page Mr. Lea asked to have these figures inserted in the record.

Page 208, fourth paragraph from bottom, Mr. Lea requested additional figures concerning casualties. These were furnished to you on October 10, 1919. If further information be desired thereon, please consult Col. Gorrell. Incidentally, these are the same data as those referred to in line 11, page 209.

Page 209, paragraph 3, change "this data" to "these data."

Page 210, line 2, change "7th of June" to read "17th of June."

Page 211, line 8, fourth word, should read "ministry."

Page 211, last word in paragraph 5, change "Dodge" to read "Dodd." The line previous to this should read: "An Air Service officer to be upon the latter's staff." In the last line of this paragraph scratch out the words "with Col. Bolling."

Page 211, fourteenth line from bottom, strike out "Breguette" and insert "Breguet."

Page 212, paragraph 16, Mr. Lea requests the insertion in the records of information concerning the British DH9.

"The following information was given on August 7, 1919, by Capt. Traill, of the British Aeronautic Mission to the United States. The answer to question No. 2 is stated to be 'a very rough guess.' The answers to statements 3 and 4 are 'moderately correct.'"

1. The date on which the British finished the design of the British DH9 is not known to Capt. Traill of the British mission.

2. The British DH9 was placed in production in or about the month of October-December, 1917.

3. The first DH9 reached the British front in March, 1918.

4. It began to arrive in quantity in April, 1918.

Page 212, fourth paragraph from bottom, next to last line of this paragraph, change "Hispano-Suiza 320" to read "Hispano-Suiza 300." Last line of this same paragraph, change "320 Rolls-Royce" to read "275 Rolls-Royce."

Page 213, scratch out last two words in eighteenth line from bottom of page "the front," and insert "headquarters of the A. E. F. in France."

Page 214, tenth line from top, third word, scratch out "four" and insert "two."

Page 214, sixth paragraph from bottom, change the words "The Spad Monocoque" to "The Spad Monosoupape."

Page 214, second word on tenth line from the bottom of page, strike out "Paige" and insert "Page." Make same correction in last word, sixth line from the top of page 215, and likewise same in eighth line of page 215.

Page 217, sixth paragraph from bottom, calls for information to be submitted showing the total number of engines produced by the United States during the war. The figures are as follows:

Engines produced to Nov. 11, 1918.

OX-5	8,318
Hispano-Suiza	3,920
LeRhone	1,057
Lawrence	450
Gnome	280
A7A	2,250
Bugatti	8
	16,283
Liberty	13,574
Total	29,857

Page 220, second word, fourteenth line, change "Breguet" to read "Bugatti." Strike out the last clause of this paragraph which reads, "there may have been two, but not more than two came over before the war ended."

Page 222, change paragraph 3 to read as follows:

"There was a strong desire to get our men out of France, lessening our ability to care for planes in storage. In addition to the cost of boxing and railroad transportation, there was a very large cost of ocean transportation—for planes shipped by vessel take a very large amount of space. It was necessary to determine the most economical thing to do with the planes we had on hand, and I exercised the best judgment I had. The planes were offered for sale, but there was no market for them, and they could not be sold. I then authorized some of them to be broken up and salvaged, the salvaged parts to be put to one side, the metal to be sold for what it would bring, and the wooden parts to be sold when possible. I do not think there was a single plane that had a Liberty engine in it that was in condition to fly or that could be put in condition to fly that was thus salvaged. Those that were so disposed of were foreign planes and were more or less obsolete, and it would not have paid, as a money proposition, to have brought them to the United States."

Page 222, last paragraph, should read: "Col. PATRICK. The wooden parts and canvas and things of that sort, I sold some with the sanction of the liquidation commission and the sales agent of the American Expeditionary Forces. For some we could obtain no bids whatever, and of this material some was used for fuel and some of it was burned up. I believe this was the economical thing to do."

Page 225, between the sixth and seventh paragraphs, you may insert the following:

"Airplanes and engines to be delivered to the Allies by United States Government.—The number of engines, planes, and airplanes which the United States was under written or implied obligation or agreement to deliver to the Allies, showing figures separately for each nation, is given herewith.

“(a) FRANCE.

“Under date of March 29, 1918, the French high commissioner applied for 6 Liberty engines. Three signed contracts were returned to him under date of May 6, 1918, covering these engines.

“Under date of May 6, 1918, the Secretary of War directed Mr. John D. Ryan to make the necessary arrangements with the French high commissioner to deliver to France, prior to July 1, 1918, 500 Liberty engines, Navy type. On May 14, 1918, Mr. Ryan advised the French high commissioner that not more than 250 engines could be delivered and asked for a definite order. On the same date the French high commissioner wrote the Secretary of War advising that France needed urgently 400 Liberty motors, Army type, and asked for information as to delivery so he could cable his Government. On May 17, 1918, the French high commissioner wrote Mr. Ryan, giving a firm order for 250 engines, and requested that a formal contract be drawn. He also referred to a request of May 1 to the Secretary of War for 1,000 Liberty engines and his second request, of May 14, for 400 engines, a total of 1,400 engines, the 1,400 to include the 250 engines to be delivered by July 1, 1918, leaving 1,150 engines to be delivered after that date. On May 31, 1918, the French high commissioner wrote, stating that the 250 engines should include 100 Navy type, with hand crank (compression 4.8); 100 Navy type, with starting device, air pump; and

50 Army type. Contract for 250 engines was duly signed and deliveries were not expected to be complete before August 1, 1918.

"On October 24, 1918, the French high commissioner was advised by the Assistant Director of Aircraft Production that Mr. John D. Ryan while in France had arranged for the sale to the French of 750 Liberty engines per month for the first six months of 1919, the first deliveries to begin in January, 1919. He was asked if a contract should be drawn covering these deliveries. On October 19, 1918, Lieut. H. H. Emmons wrote the War Industries Board that no permission should be granted to the French Government to purchase Liberty engines in the United States. It was apparently Lieut. Emmons's understanding that all disposition of the Liberty engines in France was to be made by the American Expeditionary Forces. On November 5, 1918, the War Industries Board notified the French mission that its application for motors would be held unapproved for the reasons set out in Lieut. Emmons's letter to them. On November 13, 1918, contracts covering the 4,500 engines which Mr. Ryan agreed verbally to deliver to the French in the first six months of 1919 were forwarded to the French high commissioner, who returned them unsigned on November 18, 1918, and directed the cancellation of his demand. On November 27 and 29, 1918, the French high commissioner repeated his refusal to sign contracts for 4,500 Liberty engines.

"It seemed to be Mr. Ryan's understanding that the 4,500 engines were to be delivered to the French in the United States, and not through the American Expeditionary Forces. It seemed to be his understanding also that the 1,500 engines to be delivered to the French from October 1 to December 31, 1918, were to be delivered by the American Expeditionary Forces. The agreement for these 1,500 engines was made at the same time by Mr. Ryan that he made the agreement to deliver the 4,500 engines, and was apparently meant to satisfy the French requests for 1918.

"On December 17, 1918, Maj. Gen. Mason M. Patrick, Chief of Air Service, American Expeditionary Forces, wrote to Le Sous Secrétaire d'état de l'aéronautique Militaire et Maritime, 280 Boulevard St. Germain, Paris, calling attention to the agreement between Mr. Ryan and the French authorities for the delivery of 1,500 Liberty engines by December 31, 1918, and stating that the balance of the engines were ready for delivery, 405 of them having already been turned over. On February 3, 1919, Maj. Gen. Patrick again wrote the minister of war (twelfth direction) in regard to these 1,500 engines.

Summary—French.

Date.	Re- quested by French.	Delivered under contract.	To be delivered under verbal contract.
Mar. 29, 1918.....	6		
Apr. 16, 1918.....		6	
May 1, 1918.....	1,000		
May 14, 1918.....	400		
July 24, 1918.....		31	
To Nov. 11, 1918.....		1,405	1,500
To July 1, 1919.....	1,500		4,500
Final settlement.....		3,133	
Total delivered French.....		3,575	

¹ By American Expeditionary Forces.

² Mr. Ryan.

"Final settlement with the French provides for a total payment to the United States of \$21,272,250, which covers 3,575 engines, cancellation indemnity; 3,310 sets of spares, at \$500 per set, and cancellation indemnity.

"(b) GREAT BRITAIN.

"On February 27, 1918, Brig. Gen. J. D. Cormack requested the delivery of 3,000 Liberty motors to insure the development of the program of the Royal Air Force, and contract was entered into with the British for 980 Liberty engines—the number allotted by The Adjutant General of the Army. On May 7, 1918, Gen. Cormack reported first successful flight of Liberty motor in a D. H. 9A.

"On July 8, 1918, Capt. E. C. Hugh for the British requested to be advised of the next allocation of engines.

"On October 24, 1918, Brig. Gen. Cormack was advised of the agreement into by Mr. Ryan for the sale of 750 Liberty motors per month for the first six months of 1919, a total of 4,500 motors in all. While in Europe, Mr. Ryan had arranged tentatively for a delivery of 1,000 engines to the British by December 31, 1918, deliveries to be made by the American Expeditionary Forces. On November 8, a verbal agreement was made between the Second Assistant Secretary of War, the Acting Director of Aircraft Production, and Sir Charles Gordon for 500 Liberty engines to be delivered in the weeks ending November 16 and November 23, 1918. Contracts covering 4,500 engines were sent to Gen. Cormack on November 13, 1918. Also contracts were forwarded to cover 500 engines. Neither set of contracts was ever executed.

"Final settlement with the British calls for a total delivery of 2,252 engines, including the 980 delivered prior to the signing of the armistice. Great Britain has taken 11 per cent of the total produced and had paid there \$16,589,718.90, which also covers spare parts for these engines.

Summary—British.

Date.	Requested by British.	Delivered under contract.	To be delivered under verbal contract.
Feb. 27, 1918.....	3,000		
July 11, 1918.....		980	
Nov. 8, 1918.....	500		500
July 1, 1919.....	4,500		4,500
Final settlement.....		1,272	
Total engines delivered to British.....		2,252	

"A contract was entered into with the British for the delivery of one experimental Hispano-Suiza engine of 300 horsepower.

"(C) ITALY.

"Under date of April 5, 1918, a contract was entered into with the Italian Government for the delivery of five Liberty motors (3 high-compression and 2 low-compression)."

Page 225, fourth paragraph from bottom, in second line from end of paragraph, change the word "fresher" to "refresher."

Page 220, paragraph 7, add to this paragraph the following: "The records show that 14.15 per cent of the total number of airplanes lost in fighting by American squadrons were DH-4 planes; 11.38 per cent of the total airplane losses in fighting, including those lost by American officers flying with the French, British, and Italian squadrons, were DH-4 planes."

Page 229, first paragraph, should read:

"Col. PATRICK. In so far as it was humanly possibly to do so, I think they made every effort. There were natural difficulties in conducting a war 3,000 miles away from the base—difficulties in making clear what you wanted by cable—and, gentlemen of the committee, many a time I wished I could have five minutes' talk with the man over here, so that I might make myself more clear than was possible by cable. Those difficulties always existed and always will exist under similar conditions."

Page 230, eighth paragraph from bottom, should read:

"Col. PATRICK. So far as the Air Service officers are concerned, there were only five in Europe when we entered the war, and they had been there only a short time, nor had they been preceded by other officers of this service."

Page 230, paragraph 12, should read:

"Col. PATRICK. Thirty-nine hundred and twenty Hispano-Suiza engines were manufactured up to November 11, 1918. Two hundred and forty Hispano-Suiza engines were received by the American Expeditionary Forces in December, 1918. No Hispano-Suiza engines were received by the American Expeditionary Forces from the United States prior to the signing of the armistice."

Page 230, eighth paragraph from bottom, should read:

"Col. PATRICK. All that we used in Spads were manufactured in France."

Page 230, seventh and sixth paragraphs from bottom, should read:

"Mr. FREAR. Were any Hispano-Suiza engines of American manufacture in those machines on the front?"

"Col. PATRICK. No, sir."

Page 231, fourth word from end of fifth line, change "plane" to read "place."

Page 233, third paragraph from bottom, calls for the insertion of the production record of engines in the United States:

ENGINES OF ALL TYPES PRODUCED IN UNITED STATES DURING THE WAR.

The following figures are condensed from "Monthly shipments, all types aviation engines," a chart prepared by the Bureau of Aircraft Production, historical section, and vouched for by the compiler, Capt. Ingoldsby. The bureau's method of record took account of an engine only when it was packed and loaded on cars for shipment to any point. The period covered below is from beginning to November 11, 1918, date of armistice:

OX-5:

Curtiss A. & M. Corporation-----	600
British-----	182
Willys-Morrow-----	6,136
Willys-Overland-----	1,000
Canadian-----	400
	<hr/>
	8,318
	<hr/>

Hispano-Suiza:

Wright-Martin, 150 horsepower-----	3,435
Wright-Martin, 180 horsepower-----	469
Wright-Martin, 300 horsepower-----	8
	<hr/>
	3,912
	<hr/>

Le Rhone:

Union Switch & Signal Co-----	1,057
-------------------------------	-------

Lawrence:

Excelsior M. M. & S. Co-----	450
------------------------------	-----

Gnome:

Aeronautical Engineering Corporation-----	232
Borrowed from Navy-----	48
	<hr/>
	280
	<hr/>

A 7 A:

Hall-Scott Motor Car Co-----	1,250
Nordyke & Marmon Motor Car Co-----	1,000
	<hr/>
	2,250
	<hr/>

Bugatti:

Duesenberg Motor Corporation-----	8
	<hr/>

Liberty 12:

Packard Motor Car Co., Navy-----	3,638
Packard Motor Car Co., Army-----	1,089
Lincoln Motor Co., Navy-----	7
Lincoln Motor Co., Army-----	3,765
General Motors, Buick Division-----	1,320
General Motors, Cadillac Division-----	250
Ford Motor Co-----	3,053
Nordyke & Marmon Motor Car Co-----	452
	<hr/>
	13,574
	<hr/>

Liberty 8:

General Motors, Buick Division-----	0
-------------------------------------	---

29,849

I trust that this letter will be clear and that the corrections and amendments may be made as requested. Should there be any other information along this line that you desire, I am satisfied that it could be furnished by Col. E. S. Gorrell, Air Service, as he was my chief of staff during the latter part of my service as chief of Air Service, American Expeditionary Forces, and he is thoroughly familiar with the voluminous records which were compiled in order that all facts relating to the Air Service, American Expeditionary Forces, might be available when called for.

Very truly, yours,

MASON M. PATRICK,
Colonel, Corps of Engineers (formerly Major General, United States Army; Chief of Air Service, American Expeditionary Forces).

Mr. LEA. Can you tell us about the average life of an airplane on the front?

Col. GORRELL. Yes, sir; the average life of an airplane on the front is considered to be, for pursuit aviation, approximately 50 per cent wastage per month, and for bombardment aviation approximately 33½ per cent per month, except in the case of night bombardment, which is approximately 20 per cent per month.

Mr. MAGEE. What do you mean by that? Do you mean that the ordinary life of a plane, when you speak of the life, as to efficiency—that there would be 50 per cent wastage?

Col. GORRELL. No, sir; I have drawn a chart that will show exactly and I will show you very briefly how we made the calculation. It is quite a different story from anything you have ever heard before.

To calculate the service airplanes, engines, and balloons required, the following figures, wastage on material actually delivered in France, are used:

(a) Consider the establishment of every daylight observation squadron as 24 airplanes, of every daylight pursuit and day bombardment squadron as 25 airplanes, and every multiengine night bombardment squadron as 10 airplanes.

(b) To initially mobilize each squadron the following allowance of airplanes must be counted upon: To the establishment (i. e., 10 or 24 or 25 machines) we must add 33½ per cent for reserve (this is, the maintenance for the initial month the squadron is mobilized), plus another 33½ per cent on the establishment for wastage during mobilization, plus another 33½ per cent for the training of pilots in the Services of Supplies. This gives the total number of machines required to initially mobilize a squadron as double the actual number of machines in the service establishment.

(c) The rate of wastage allowed varies according to the duties on which the squadron is employed. These rates of wastage per month for the various machines are as follows:

1. Daylight machines, 50 per cent of the establishment, plus 10 per cent of this 50 per cent for wastage in delivery, plus 20 per cent on the 8 training airplanes, or 16 machines per month. (12 plus 2 plus 2 equals 16.)

2. Nighttime machines, 33½ per cent on the establishment, plus 10 per cent of this 33½ per cent for wastage in delay, plus 20 per cent on the 3 training machines, or 5 airplanes per month. (3 plus 1 plus 1 equals 5.)

(d) To calculate the number of engines required for a squadron, assume a capital basis—that is to say, a certain number of engines—which we consider to be 100. This number is regarded as sufficient to maintain a squadron in the field indefinitely subject to two points, namely:

1. That facilities for repairing the engines which become unserviceable are available and that these engines can be put back into service, repaired, and almost equal to new engines within two and one-half months after the time when they become unserviceable.

2. That a small monthly supply is available to replace engine loss over the line or so badly damaged as to be no longer repairable.

(e) This small allowance just referred to is 7 per cent of the capital basis, or seven engines per squadron per month.

(f) With regard to the capital basis for the establishment of engines this must be supplied over a period of three months as follows: Twenty-five per cent in the month before that in which the squadron is to be mobilized; 50 per cent in the month during which the squadron is to be mobilized; and 25 per cent in the month after the squadron has been mobilized. Thereafter, only the wastage as hereinbefore indicated is necessary.

(g) This method of calculation assumes that a liberal allowances of spare parts, for both engines and airplanes, is available.

(h) The above figuring does not include airplanes that are necessary to be built for use in America and not actually delivered to a port in France.

(i) Consider the life of a balloon as three months. This means a replacement of 33 $\frac{1}{3}$ per cent.

For example, if it be desired to place one pursuit squadron on the front during each of the months of January, February, March, and April, the following airplanes and engines would be necessary:

Airplanes for pursuit squadrons, 1919.

To be placed on front per month.	January.	February.	March.	April.
1 squadron.....	50	16	16	16
Do.....		50	16	16
Do.....			50	16
Do.....				50

Engines for pursuit squadrons.

To be placed on front per month.	December, 1918.	1919			
		January.	February.	March.	April.
1 squadron.....	25	50	25	7	7
Do.....		25	50	25	7
Do.....			25	50	25
Do.....				25	50

By adding the figures shown you obtain totals showing your required monthly production.

You will notice how rapidly this production increased as months go by.

The above tabulations are simply illustrations to show the application of figures mentioned in the above system of calculating the wastages of air planes and engines.

Mr. MAGEE. Have you told how long it can be used efficiently?

Col. GORRELL. You would lose about half your pursuit planes per month by enemy action or due to crashes in landing—being put out of action by the enemy, by crashes, and also by deterioration.

Mr. MAGEE. But wouldn't some of those machines keep going on account of repairs?

Col. GORRELL. To be exact, for one squadron of 25 pursuit planes, it is necessary to furnish 16 planes per month to keep up the squadron's strength to 25.

Mr. MAGEE. What I had in mind was whether there wasn't ordinary efficient life as a fighting plane?

Col. GORRELL. If the enemy did not shoot it down and you did not crash on landing, it would last perhaps 120, 130, or 150 hours.

Mr. MAGEE. You mean hours of actual use?

Col. GORRELL. If you put them in storage they would deteriorate, beyond any ability to use them, in less than two years' time.

Mr. MAGEE. The value of them?

Col. GORRELL. Yes, sir.

Mr. LEA. What did the Allies do with the obsolete machines on the front?

Col. GORRELL. They had to continue using them until the production of up-to-date machines in their factories could come through in sufficient quantities to replace them on the front. In other words, at all times on the front, each nation had to use, to a greater or less extent, some machines not considered of the latest type. I have a diagram here showing all the airplanes in use on the French front in February, 1918. It divides them into "obsolete" and "up to date," and shows that the French were using some 63 per cent classified as obsolete:

In order to show existing conditions and their resultant effect on the supply of service equipment to our squadrons on the front, I bring to your attention the following figures showing the condition of the equipment used by the French aviation in February, 1918:

Aeroplanes in use by French Aviation.

	Obsolete.										Up to date.			
New.....	172	11	75	6	393	264	68	100	8	7	380	113	32	174
Good.....	50	21	30	....	65	49	12	1	1	1	107	8	....	5
Under repair.....	43	3	6	....	67	42	32	13	10	2	71	44	2	61
Out of commission.....	3	....	2	....	3	....	2	....	3	....	9	....	....	....
Total.....	269	35	75	6	528	355	114	114	22	10	567	165	34	240

Total, obsolete..... 1,528

Total, up to date..... 1,006

Grand total..... 2,534

It has been said that America did not take proper precautions in getting planes from the French and the planes we used were not as good as the French had. Here is a very brief tabulation which shows the number of planes we accepted and the number that we rejected:

Acceptance and rejection of airplanes received from the French Government.

Accepted when first presented.....	2,126
Accepted after 1 rejection.....	597
Accepted after 2 rejections.....	191
Accepted after 3 rejections.....	52
Accepted after 4 rejections.....	17
Accepted after 5 rejections.....	7
Accepted after 6 rejections.....	5

Total acceptances..... 2,995

Never accepted..... 399

Total inspections by A. E. F., Air Service Technical Section..... 3,394

Reasons for rejections:

Motor trouble.....	439
Poor workmanship.....	274
Poor material.....	702
Flight defects.....	309

Total rejections..... 1,814

Mr. LEA. Can you give any statistics comparing the victories and losses of our forces as compared with those of the enemy?

Col. GORRELL. Yes, sir; I have tabulated that into a statement which I have here and which is as follows:

Airplane and balloon losses due to hostile action.

	United States.			Enemy.		
	Planes.	Bal- loons.	Total.	Planes.	Bal- loons.	Total.
First Army.....	203	48	251	510	54	564
Second Army.....	2	.....	2	6	1	7
Seventeenth Squadron attached to R. A. F.....	19	.....	19	51	3	54
One hundred and forty-eighth Squadron attached to R. A. F.....	8	.....	8	71	.....	71
Individuals attached to R. A. F.....	36	.....	36	75	11	86
Individuals attached to I. A. F.....	9	.....	9	9	.....	9
Individuals attached to Italians.....	3	.....	3	3	.....	3
Individuals attached to French.....	9	.....	9	51	3	54
Total.....	289	48	337	776	72	848

NOTE.—The foregoing tabulation shows the losses sustained in aircraft by these divisions of the American Air Service, with the enemy losses inflicted by these same branches respectively: For 1 airplane lost by A. E. F., 2.69 enemy airplanes were shot down; for 1 balloon lost by A. E. F., 15 enemy balloons were shot down; for 1 aircraft lost by A. E. F., 2.51 enemy aircraft were lost.

From the above tabulation, it is seen that the victories and losses are given in terms of aircraft and apply to Americans on the American, British, French, and Italian fronts. There is one point to be kept in mind. People are prone to take a list of aces and add up their victories. By doing so, they get a total much greater than the number we actually shot down. That is because of this reason: In the American system of crediting victories, if more than one man tackled a German plane and shot that plane down, each man was credited with a German victory. That system is not embodied in the paper you are putting in the record. That is a record only of airplanes shot down without any regard as to the number of people engaged in shooting them down. The number of actual airplane losses and actual balloons that the Boches lost are there.

Mr. LEA. What opportunity did you have over there to observe operations on the front?

Col. GORRELL. During the summer and fall of 1917, I was on the British, French, and Italian fronts off and on at various times. In each of these cases I was in consultation with the various commanders of those forces and came in contact with the highest officers in the air forces of each of these countries, and in some cases with the highest officers in the ground service. Because of the knowledge gained that way, I was placed in charge of strategical aviation, A.E.F., and was, therefore, in charge of all preparations that were being put forth for our bombardment effort in that war. After I had been in charge of the strategical aviation from the end of November, 1917, until the 5th of February, 1918, I was made a member of G-3, operations section of the General Staff, at general headquarters. I had an opportunity at various and frequent times to go to the various fronts and observe operations. I am one of the two officers requested by the headquarters, First Army Corps, to take charge of the aviation that they had with them at that time at Chateau-Thierry. It was the largest aviation command at that time on the American front. The Air Service asked for me to be

placed in command of our first day bombardment unit, with a view to later taking command of all our bombardment on the front. The operation section, General Staff, at general headquarters, refused to release me, saying that I would get my chance later on and that I would be of greater service where I was. As a member of the operations section at general headquarters, I took part in planning the various Air Service activities for the front, and drew, for the approval of my senior officers, many of the original aviation operation projects.

Later, after the armistice was signed, I was made responsible for the compilation of the Air Service tactical manuals. I was slated to command the Air Service of the American Third Army on the Rhine, but it was demobilized and I did not take over the command. I am now working with the War Plans Division of the General Staff.

Mr. LEA. In making these decisions as to plans and measures, were you acting with authority?

Col. GORRELL. No, sir; at no time had I any authority. I was always an advisor to some senior officer in making recommendations. Col. Bolling was my senior until about the 20th or the 24th of November, 1917, and the various decisions which were rendered up to that time and to which I have testified were my advice. The final authority lay in Col. Bolling. In some cases the final authority lay in Gen. Pershing. I would like to say, since Col. Bolling is dead, that I am the man who is to be held responsible and desire to be crucified, if there is any crucifixion, for any technical decision made in the Air Service, A. E. F., from August 15, 1917, until November 20 or 24, 1917.

Mr. LEA. You mean he made no decisions but what you recommended?

Col. GORRELL. As a general rule we were in accord, and as a general rule the cables were first written by myself and taken to him. Sometimes he would change them and sometimes he would send them intact.

Mr. LEA. There were a number of times when we needed more airplanes?

Col. GORRELL. We always needed more, but what we had was the best compromise under the military situation that forced us. All nations always wanted more planes—and changed their programs according to their ability to increase production. For our proposed army of 3,000,000 men, the headquarters of Gen. Pershing told us that we could have 358 aero squadrons, which meant that 1 man in 12 would have been in the Air Service. The Chief of the Air Service said that it could not grow that large in that length of time and that the maximum would not be more than 202 squadrons.

Mr. LEA. Do you have any knowledge regarding the burning of airplanes?

Col. GORRELL. I did not see any burning of airplanes, and I did not personally witness any salvage of airplanes. My knowledge is only that first as Assistant Chief of Staff and later Chief of Staff, Air Service, to the Chief of Air Service, Gen. Patrick.

Mr. LEA. Did you see Gen. Patrick's statement?

Col. GORRELL. I looked for it in the record, but I could not find it therein, so I brought a copy, which I will insert in the record if you

wish. He has a very brief statement about it in his testimony of August 4, 1919.

Mr. LEA. What was that statement that you referred to?

Col. GORRELL. The Johnson Committee of the House was investigating the question and Gen. Patrick wrote a letter, of which this is a true copy, telling about the situation of the salvage of airplanes.

Mr. MAGEE. To whom is that investigation?

Col. GORRELL. To Mr. Flood of the House committee.

Mr. MAGEE. That is not in our record.

Col. GORRELL. You are correct; that does not belong in your record. It probably is in Mr. Johnson's record.

Mr. MAGEE. Some one testified that only those planes which had been in use were burned and that the parts which they regard as of salvage value had been removed.

Col. GORRELL. Gen. Patrick testified to that. The General had considered the question of returning these planes to the United States, but we figured it would cost eleven or twelve hundred dollars to ship these planes to United States.

Mr. LEA. Were any Army planes actually shipped?

Col. GORRELL. Yes, sir; 1,551 planes were shipped to the United States. I can give you that in detail. Also there were 347 German planes sent to the United States which were taken over from the enemy under the armistice conditions. Very few of them were new.

Here are two tabulations; one is called the interallied type of airplanes shipped to the United States up to and including final shipment of August 20, 1919, which follows:

Interallied types of airplanes shipped to United States up to and including final shipment of Aug. 20, 1919.

Type.	Engine.	Horse-power.	Quantity.
Avro D.....	Le Rhone.....	120	7
A. R.....	Renault.....	300	1
Breguet 14A2.....	do.....	300	20
Do.....	Fiat.....	300	2
Breguet 14E2.....	Liberty.....	400	5
Caproni.....	Without.....	.....	1
Cundron R-11.....	Hisp.-Suiza.....	220	2
De Haviland 4.....	Liberty.....	400	612
De Haviland 9.....	Without.....	.....	1
F. E. 2B.....	Beardmore.....	160	5
Gourdou 1.....	Hisp.-Suiza.....	180	.....
Nieuport 21.....	Le Rhone.....	80	24
Nieuport 24.....	do.....	120	71
Nieuport 27.....	do.....	120	3
Nieuport 28.....	Gnome Mono.....	160	88
Nieuport 29 ¹	Hisp-Suiza.....	300	.....
Nieuport 31.....	Le Rhone.....	80	1
Morane 1.....	do.....	120	.....
Do.....	Liberty.....	400	.....
Salmon.....	Salmon.....	230	95
S. F. 5.....	Hisp.-Suiza.....	180	7
Sopwith A2.....	Clerget.....	120	52
Do.....	Le Rhone.....	120	25
Sopwith Camel.....	Clerget.....	130	10
Sopwith B2.....	do.....	130	1
Sopwith D2.....	do.....	130	14
Sopwith Dolphin.....	Hisp.-Suiza.....	300	4
Spad 7.....	do.....	180	58
Spad 12.....	do.....	220	1
Spad 13.....	do.....	220	435
Spad 16.....	Lorr. Dietrich.....	220	6
Spad (Habeimond) ¹	Hisp.-Suiza.....	300	.....
Spad (Demarcey) ¹	do.....	300	.....
Total.....	.....	.....	1,551

¹ The French Government was not in a position to deliver these airplanes to the United States Air Service before the closing out of our activities at Romorantin, hence order for same was canceled.

In addition there have been shipped to the United States 183 incomplete DH-4 airplanes in crates, as received by the production and maintenance division from the United States.

Source: 1. Progress report No. 29, dated May 21, 1919.

2. Daily reports of shipments to United States from production and maintenance division, Romorantin.

I also have a list of German airplanes shipped to the United States up to and including final shipment on August 20, 1919, which is as follows:

German airplanes shipped to United States of America, up to and including final shipment, Aug. 20, 1919.

Type of plane.	Engine.	Horse-power.	Number shipped.
A. E. G. J2.....	Benz.....		2
A. E. G. G4.....	Mercedes (2).....	260	5
A. E. G. G5.....	do.....	260	4
Albatross D5.....	Mercedes.....	160	6
Do.....	do.....	160	12
Albatross D5A.....	do.....	160	8
Albatross D2.....	do.....	160	2
D. F. W. G5.....	Benz.....	225	10
Friedrichshafen G3A.....	Mercedes (2).....	260	10
Friedrichshafen G3B.....	do.....	260	2
Friedrichshafen G4.....	do.....	260	1
Fokker D7.....	Mercedes D3A or B. M. W.....		142
Fokker D6.....	do.....		4
Fokker DR1.....	do.....		2
Fokker E5.....	do.....		3
Gotha 7.....	Mercedes (2).....	260	2
Gotha 9.....	Maybach (4).....	260	5
Gotha G5B.....	Mercedes (2).....	260	2
Halberstadt CL2.....	Mercedes.....	180	11
Halberstadt CL4.....	do.....	180	5
Halberstadt C5.....	Benz.....	225	18
Halberstadt D3.....	Argus.....	120	1
Hanover CL3A.....	Opel.....	200	7
Junker J. F. C. C. 1.....	Benz.....		8
Junker RE5.....	Mercedes.....		1
L. V. G. C6.....	Benz.....	225	9
L. V. G. C5.....	do.....	225	2
Pfalz D12.....	Mercedes.....	180	7
Pfalz D13A.....	do.....	160	4
Pfalz D8.....	do.....	160	1
Pfalz D3.....	do.....	160	6
Roland D6B.....	Benz.....	200	26
Roland D6A.....	Mercedes.....	160	4
Rumpler Rubild MB.....			6
Rumpler Rubild C1.....	Mercedes.....	180	1
Rumpler Rubild C4.....	do.....	180	4
Rumpler Rubild G6.....			2
Simons Schukert D4.....	Siemens.....	180	2
A. E. G. G4.....	Mercedes (2).....	260	1
Total.....			347

Source: Reports of salvage and repair department, Air Service Production Center No. 2, Romorantin.

Mr. LEA. If you know, will you please tell us what you know about the burning of those airplanes? What was the authority for it, or what the orders were.

Col. GORRELL. In accordance with a combination of law and regulations. It was done by what is called a survey board appointed to act upon property considered of no further serviceable value. The procedure is for the officer who is responsible for the property to list it on a survey blank and then to swear that the statements concerning it are correct. He is under oath in making that statement. A survey board is appointed, usually formed of three officers. Sometimes one more, but in the case of these burned and salvaged airplanes, three officers of experience in aircraft engineering and

aircraft knowledge were appointed to perform the duties of the survey board. They were picked by reason of their knowledge of aeronautical engineering and all about aircraft, and were considered the best men we could get. Those were the men who inspected these aircraft. The aircraft which we had may be divided in two classes. There were those which were capable of being sent home to the United States and thereafter be put to use and there were those which, if sent to the United States, could never have been used again. It would have cost \$1,100 to \$1,200 to ship an airplane to the United States, including the boxing, required for its shipments. In addition to that, you would have delayed by that much longer the shipment of our troops back home.

Mr. MAGEE. Why did it cost so much?

Col. GORRELL. The cost of transportation was figured at \$125 for the shipment from the base on the railroad.

Mr. MAGEE. You mean it would cost that on the railroad?

Col. GORRELL. It would cost between \$1,100 and \$1,200. That was divided like this: About \$125 on the railroads in France; about \$500 for boxing and packing for shipment at Romorantin. It cost \$289 in the United States to box a DH-4 airplane for shipment to Europe. With the higher cost in Europe, it would have cost us about \$500 to box it for return to the United States. After it left Romorantin for an A. E. F. port, we figured it would cost about \$60 on the railroad. Across the ocean it would cost about \$215.

Mr. MAGEE. Where would that cost come in?

Col. GORRELL. It was in the additional length of time you would use your shipping and the cost thereof.

Mr. MAGEE. It don't mean cost in money?

Col. GORRELL. The Government must stand for the maintenance of the transport system.

Mr. MAGEE. Suppose it was a transport service. Does the Government pay a premium for it?

Col. GORRELL. It would be necessary for it to pay for the maintenance of the transport.

Mr. MAGEE. Well, then, you figured the cost to the Government of maintaining transports in getting the planes across.

Col. GORRELL. I am figuring it in so far as \$115 is concerned.

Mr. MAGEE. You are not figuring in actual dollars and cents?

Col. GORRELL. I am figuring in the actual payment necessary for shipment by transport. After it got here, the Government would have to spend \$175 to ship it on the railroad. We arrived at that by the places which the Government was using, for example—

Mr. MAGEE. I noticed on Rockwell Field, San Diego, Calif., on sides of the field, there were rows of what those in charge of the committee said were airplane boxes. I suppose the Government shipped them to San Diego, Calif. It probably cost them more than near the coast.

Col. GORRELL. The \$175 I got by averaging the cost of shipping from New York to San Antonio, Middletown, and Mount Clemens. I took the cost to these three places and divided by three and that gave me the average of the three points, which amounted to \$175, and then it would cost the Government about \$50 more to unbox and set up the airplane.

Mr. MAGEE. Then it would have been a much cheaper proposition to have burned all those new planes than to ship them to this country?

Col. GORRELL. No, sir; the new planes cost from twelve to fifteen thousand dollars apiece.

Mr. MAGEE. Why didn't you sell those new planes there—you sold \$27,000,000 worth?

Col. GORRELL. No, sir; not of those in Europe. The sale you mention was of training airplanes in the United States. I have no knowledge of the sale of these training planes.

Mr. MAGEE. But you have knowledge of the sale of training planes?

Col. GORRELL. I have no knowledge of the facts concerning it. I am now serving with the General Staff and am not on duty with the Air Service.

Mr. MAGEE. Did you ever figure up what the Government got in that statement?

Col. GORRELL. No, sir; I have not. I have seen the statements in the newspapers but I really do not know anything about them.

Mr. MAGEE. You don't pay attention to things of that kind?

Col. GORRELL. I have not paid any attention to the details.

Mr. MAGEE. You do not doubt the details of the statement that planes were sold at over 10 per cent of the cost to the Government?

Col. GORRELL. I have no knowledge of it. I can't say what price they sold for.

Mr. LEA. It was 12 or 13 per cent of the actual cost. It was \$22,000,000, roughly, and they sold for \$2,000,000—something of that kind.

Mr. MAGEE. I think 12 or 13 per cent of the actual cost to the Government—that would be how much per plane?

Mr. LEA. It was about \$400 a plane. That was the average price.

Col. GORRELL. Those were training planes, and the planes we had in the A. E. F. were service planes.

Mr. LEA. What did these training planes cost?

Col. GORRELL. I really do not know, sir; but I imagine somewhere about \$10,000.

Mr. MAGEE. What could you get if you sold any of these planes that were shipped across? Could you have sold them for any more than was received for these training planes?

Col. GORRELL. Not that we know of.

Mr. MAGEE. And you say that inside of two years, standing in the storehouse, they would deteriorate so that they would be valueless—suppose they put them out of doors as they are on Rockwell Field, San Diego?

Col. GORRELL. I have seen a time in Mexico when out of doors two planes deteriorated in two weeks time, and others I have seen deteriorate in less than six months in out-of-door service.

Mr. MAGEE. What object can you see in the Government paying twelve or thirteen hundred dollars to get these new planes from overseas to this country?

Col. GORRELL. We had to take these planes on liquidation—

Mr. MAGEE. We are talking about the money basis?

Col. GORRELL. It gives you the service planes for use on the Mexican border.

Mr. MAGEE. Didn't you have plenty of training planes there?

Col. GORRELL. It is a sad state of affairs, but many of the men who flew in the United States here were unable to fly a service plane.

Mr. MAGEE. Is this DH4 a service plane?

Col. GORRELL. Yes, sir; but we do not have pursuit type service planes.

Mr. MAGEE. You had the DH4, and you had enough of those for any service you might need along the border?

Col. GORRELL. Yes, sir; but you are not preparing your army solely to beat the Mexicans.

Mr. MAGEE. But why would it not have been better to pay, if that is so, twelve or fifteen hundred dollars to bring them over here?

Col. GORRELL. The machines which were shipped to the United States—out of 1,551 shipped to the United States—only 612 were HD4's. In fact, 900 were of the European type.

Mr. MAGEE. What did you do with those when you got them over there?

Col. GORRELL. For example, some are for experimental purposes.

Mr. MAGEE. How many were utilized for experimental purposes?

Col. GORRELL. I should say one or two of each of the types which had not previously reached this country.

Mr. MAGEE. What I mean to say is this: Is it not a fact that if the planes shipped over here, if they deteriorate as rapidly as you have stated and cost twelve or thirteen hundred dollars apiece to get them over here, the fact is simply getting here so much junk, which is really of not very much value to the Government.

Col. GORRELL. It isn't so much junk—but it would be a much more sensible investigation if you really inquired as to why we sent those planes to the United States rather than to investigate why we burned airplanes in France.

Mr. MAGEE. I am not investigating the burning of them.

Col. GORRELL. Some of the newspapers are crucifying us for doing so.

Mr. MAGEE. To get right down to the money value to the Government, if it cost twelve or fifteen hundred dollars to get one of these planes over here, it would not be a very good financial proposition to bring them over, would it?

Col. GORRELL. In some cases, no; from the standpoint of the pursuit planes, yes, sir. There were several points in there. The planes we shipped to the United States were not determined by Gen. Patrick. Most of those orders were given by cable and by orders from the liquidation commission. If a plane was of no value and could not be used for development work in this country it was not ordered shipped to the United States. As regards the flying of service airplanes, you can not take a man who is only a DH flyer and put him on a Spad 13 and expect him to fly it. If you compel such a man to fly one he would kill himself.

Mr. MAGEE. How many have you here who are flying Spad 13?

Col. GORRELL. We sent here 435 of the latest Spads and 58 Spad 7's.

Mr. MAGEE. You do not know whether any material amount of them were distributed? You do not know whether any of them are in use or not?

Col. GORRELL. No, sir; that is handled by the Air Service.

Mr. MAGEE. I was thinking that the actual cost of transportation of machines of twelve or thirteen hundred dollars—I can not see that the Government would save any money.

Col. GORRELL. They would save on the machines used for pursuit and for other purposes.

Mr. MAGEE. I understand that the majority of pursuit machines have a maximum life from 130 to 140 hours, respectively.

Col. GORRELL. All machines should be gotten rid of after about 150 hours, so that the life of a machine is very short.

Mr. MAGEE. It would have been a more advantageous proposition to get a business firm to manufacture pursuit planes here, but it would be practically wasting time to transport these machines from overseas at a transportation cost of about \$1,300 each.

Col. GORRELL. Not exactly so, because these four or five hundred pursuit planes could be used to fill in a gap until you could manufacture new planes.

Mr. MAGEE. Well, you have no war on now.

Col. GORRELL. But a very strong liability of a war.

Mr. MAGEE. Well, after that——

Col. GORRELL. Well, after that, we will have used them to train those men to fly pursuit planes.

Mr. MAGEE. You do not know whether or not any of them are being used now?

Col. GORRELL. I can not say.

Mr. MAGEE. Isn't it of far greater importance, for the future protection of the country, to get in shape so that you can make some of these pursuit and bombing planes yourself?

Col. GORRELL. Yes, sir; I agree with you, and it might be a good thing if your committee made such a report based upon the report of the board of general officers which was filed with the Secretary of the War several days ago. This board of officers was convened to report upon the bills which proposed the creation of an executive department of aeronautics.

Mr. MAGEE. Then, I take it from the testimony by you and other officers who have spent considerable time in the business that the improvement prompts their action and the progress of perfecting machines is so fast that even when you get a type of machine that seems perfect at the time, within a very short distance of the future it may be regarded as obsolete.

Col. GORRELL. That is true, sir, and especially true of pursuit-type planes.

Mr. MAGEE. So that there must be a constant improving of the engine, just like the perfection of any other piece of machinery, like the reaper.

Col. GORRELL. Yes, sir. Exactly so. The Germans placed seven types of pursuit planes on the front in the last six months of the war in order to get the advantage of the Allies.

Mr. MAGEE. So that the points you wish to emphasize are that you must make this a business that will work itself?

Col. GORRELL. Our aviation must be put on a commercial basis so that it will never be jeopardized from now until eternity; so that

it will be on a commercial basis with civilians using airplanes in ordinary life. Then when you go to war, you will have your manufacturing facilities, etc.

Mr. MAGEE. You must encourage the public to get into the commercial end of it in any case?

Col. GORRELL. Yes, sir; and that is why it will require a large appropriation by Congress for a number of years to bring that about. For example, you spent and give away many millions for railroads and for automobiles and vehicles you spend millions on roads. Every year we spend millions of dollars for this work. A similar duty would be to build terminals for airplanes.

Mr. MAGEE. I am there with you in this proposition of airplane aviation. I don't care so much about the past as I do about the future, and I noticed the other day that you did not get the additional appropriation of \$15,000,000 which was asked for. I do not know just what reasons were given for not giving a reasonable appropriation for aviation.

Col. GORRELL. I do not know, sir, but I know that the Aviation Service does not contemplate spending a single cent with the industry for new types of planes during the fiscal year ending in June, 1920.

Mr. MAGEE. I understand that they have not had sufficient appropriations made. What reasons were given?

Col. GORRELL. I am not in touch with the reasons.

Mr. MAGEE. Was it because the reorganization of the Army is planned and the matter will be taken over in the proposed reorganization or what is the reason given?

Col. GORRELL. I do not know. It lies with Congress entirely.

Mr. MAGEE. Does there seem to be any hostility on the part of anyone?

Col. GORRELL. No, sir; there seems to be an attitude on the part of some Members of Congress that—"Air Service, if you get away from the Army and Navy entirely, then we will give you anything."

Mr. MAGEE. What is the reason given? In other words, it is hard for me to conceive that Members taking a supposed hostile course to the proposition that the United States should be first in aviation.

Col. GORRELL. It strikes me as an attempt on the part of some to justify an air force in a separate Department of Aeronautics which will deprive the Army and Navy of their air units.

Mr. MAGEE. You understand a large appropriation would be given if the Aviation Service was not a part of the branch, respectively, of the Army and Navy?

Col. GORRELL. Yes, sir; and I understand that an attitude is being taken to force that to occur. That, of course, is solely a question of rumor. I want to say right here that the United States could not make a more false move than to do just that. If you create a Department of Aeronautics which includes the Army and the Navy air forces or if you set up a military air force independent of the Army and the Navy you have laid the basis of failure on the field of battle in the next war.

Mr. MAGEE. You don't agree with the Assistant Secretary of War?

Col. GORRELL. No, sir.

Mr. MAGEE. How do you expect to get any real progress in aviation unless you can get somebody whose sole business it will be to devote his time and attention to aviation?

Col. GORRELL. The first necessary decision is a statement of the attitude of Congress concerning the size of future aeronautical appropriations. If Congress gives large appropriations, your answer is one thing. You must then create a civilian agency to handle civilian aeronautics, national and international. Under that agency should come procurement of aircraft and all aircraft supplies for all Government departments. It should also encourage commercial aeronautics; it should handle all experimental work common to all aeronautics but not including strictly Army and Navy technical work. You put nearly all aeronautics under that civilian agency, but the personnel and units of the military and naval air forces you leave to the Army and Navy. You should not create any military air force not under Army and Navy control. Congress can then have one committee to deal with aeronautical questions. Now, the reason you must keep your military air forces in the Army and Navy is very fully set forth in that report of which I spoke. You can not have aviation absolutely separate from the military forces for the reason that it must be trained as an integral part thereof, so that in warfare when you get down to the zero hour our Infantry, aided by coordinated efforts from other arms, may go forward to success.

Mr. MAGEE. Then you would not have any objection to a department of aviation which did not include the aviation of the Army and Navy—then you have to have aviators for the Post Office Department and you can use aviators for the Interior Department for assisting on forest fires.

Col. GORRELL. Exactly, sir.

Mr. MAGEE. If you have the aviation service under the Secretary of War, his duties are so many, and they are so important and in so many directions that it is hard to fix responsibility in the department, which reflects in the results obtained. And the same cases are applicable to the Navy.

Col. GORRELL. That is very true, sir.

Mr. MAGEE. Now, of course it seems that if you had a department of aviation then you would have some head that would not have anything to do so far as official duties are concerned and upon whom can be staked the responsibility and whom the public could make accountable and upon whose department all these other departments of the Government could call upon for aviators—men in the service.

Col. GORRELL. Yes, sir; I have right here this board report. This is a board report of four general officers, showing their opinion upon the advisability of the establishment of a department of aeronautics as contemplated in Senator New's bill and Representative Curry's bill. This was released yesterday, and I will be very glad to give it to you.

Mr. MAGEE. Well, if you can spare that copy of the report, I suggest that it be copied into the record.

REPORT OF A BOARD OF OFFICERS CONVENED AT WASHINGTON, D. C.

BY ORDER OF THE

WAR DEPARTMENT,
THE ADJUTANT GENERAL'S OFFICE,
Washington, August 8, 1919.

From: The Adjutant General of the Army.

To: Maj. Gen. Charles T. Menoher, office Director of Air Service, Washington, D. C.

Subject: Appointment of board of officers.

1. A board of officers to consist of: Maj. Gen. Charles T. Menoher, Maj. Gen. Frank W. Coe, Maj. Gen. William G. Haan, Maj. Gen. William J. Snow, is appointed to meet in this city at the call of the senior member of the board for the purpose of reporting on bill H. R. 7925, to establish a department of aeronautics, and upon the adjournment of the board the officers named will return to their proper stations.

2. Report of the board will be submitted to the chief of staff as soon as practicable.

By order of the Secretary of War.

WM. KELLY, Jr.,
Adjutant General.

NOTE.—Oral instructions extended the above to include also the Senate bill 2693 (Senator New).

OCTOBER —, 1919.

1. The first meeting of the board was held in Washington, D. C., on August 12, 1919. Thereafter other meetings were held at frequent intervals.

2. The board has examined many individual reports of boards, commissions, and other documents bearing upon the subjects under consideration. It has also examined a number of witnesses orally and, in answer to its inquiries, has received telegraphic reports giving opinions of important division, corps, and Army commanders who actually took part in combat using aircraft as a part of their commands. Letters from military aviators advocating a separate department were sent to the board by order of Brig. Gen. William Mitchell, Air Service, United States Army, who is, himself, an advocate of a separate aeronautical department coordinate with the Army and Navy. These are all covered in the following appendices:

Appendix A. Important, memoranda, etc.

Appendix B. Names of witnesses examined orally without making record.

Appendix C. Opinions of important commanders received by telegraph at the request of the board.

Appendix D. Letters written to the board at suggestion of Brig. Gen. William Mitchell, Air Service, United States Army, from aviators favoring a separate department of aeronautics.

Appendix E. Letter from Post Office Department in connection with letter mail.

3. Fundamental considerations: Practically all men who have given this subject careful consideration are agreed upon certain fundamental facts, which may be stated as follows:

(a) In future wars aeronautics will play an increasingly important rôle, the magnitude of which will, in large measure, be in proportion to the capacity of the Nation to produce aircraft and to train personnel for its maintenance and operation.

(b) On account of the short life of aircraft and the great cost of production and maintenance, no nation can in time of peace maintain military air fleets even approximating in size to such as will be necessary in time of war. Such military air fleets must, therefore, be provided after the beginning of the emergency. The nation which is prepared so that it can be the first to produce, equip, and maintain a superior air force will have an undoubted advantage.

(c) If commercial aeronautics were a paying business, large plants would be established in the United States for producing commercial aircraft without other governmental stimulation than that provided for other business affairs. These plants would develop expert aeronautical engineers, expert mechanics, and all classes of personnel necessary for aircraft production and maintenance. In time of war the Nation's producing capacity, already organized, would be

diverted from the production of commercial aircraft to the production of military aircraft. This would be comparatively a simple proposition. The Nation would also have a great reservoir of commercial aviators from which, in a short period of time, military aviators could be selected and trained, and a limited portion of its commercial fleet could be utilized without radical alterations for certain war purposes. Thus, at the beginning of the war, it would be possible to develop under military control, in a most expeditious manner, probably the largest and best military air force that any nation could produce.

(d) At the present time commercial aeronautics is not a paying business; neither is there any prospect that commercial aeronautics will, in the near future, develop in any large measure by itself. Even with governmental support, no definite period can be fixed after which commercial aeronautics will be able to stand by itself. Up to the present time, Congress had not seen fit to make appropriations for the purpose of developing commercial aeronautics.

This is the only means by which commercial aeronautics on anything like a large scale, and hence production on a large scale, can be developed in the immediate future. The extent of such development will be in proportion:

(1) To the size of annual Government appropriations, and

(2) To the period of years for which such appropriations are guaranteed.

Private capital will not undertake the development of an industry based upon a single annual appropriation without any guaranty as to subsequent appropriations which will be necessary for the continued maintenance of the industry.

NOTE.—For a possible exception to this statement, see Appendix E.

(e) The Government itself should not undertake the production of aircraft; such action could only be justified to counteract trade combinations against the Government. Competition by the Government with private industry will always tend to destroy the latter. Government production may be a necessity in the case of articles of no commercial value, as ordnance. On the other hand, no sound business reasons can be advanced for Government production of commercially successful material, such as motor transport. The production of aircraft, while not yet in this class, might, by adequate Government assistance, eventually come thereunder. The eventual existence of large commercial air fleets, foreseen by many, would place it entirely in the latter class.

(f) Federal agencies should be provided for the adequate control of various matters connected with aeronautics, both commercial and military. These are discussed at length in the various reports listed above, and the mention of the following most important provisions is sufficient at this time:

(1) Provisions for furnishing to air fleets the necessary meteorological data similar to that now furnished by the Weather Bureau to shipping.

(2) National and international regulation of air traffic.

(3) The licensing of pilots.

(4) Inspection and licensing of aircraft.

(5) Standardization of signals and maps.

(6) Enactment and enforcement of laws relating to accidents and insurance.

(g) It is desirable that a single Governmental agency be responsible for the procurement of all aircraft used in the Government service, in order that duplication and waste may be avoided and that the producing industry of the country may be judiciously fostered in the placing of Government orders.

(h) It is also admittedly desirable that a single Governmental agency should be established for the purpose of development work, in so far as these matters pertain to development common to all branches of aeronautics—military, naval, and commercial. This agency should be provided with the means for carrying on experimental and research work and for testing materials. It should also be charged with the collection and publication of data valuable to provide industry or individual inventors and, where not incompatible with inventive progress, with the standardization of material, equipment, and methods of construction.

(i) Various civil departments of the Government have need of aircraft in the performance of their functions and in the improvement of their service to the public. Such appropriations as Congress may provide for these purposes will serve to aid the aircraft industry, but can not produce far-reaching results.

4. With the acceptance of the foregoing, there appear to be three different lines of investigation which demand further study; these may be stated as follows:

(a) In case large congressional appropriations be made for the purpose of assisting commercial aeronautics, what specifically are the means or methods whereby this purpose is to be accomplished?

(b) Is a separate department of aeronautics necessary to build up commercial aeronautics and control all questions relating thereto?

(c) If a separate aeronautical department or agency be established, should it include the aeronautical services of the Army and Navy?

These will be considered in order.

5. (a) In case large congressional appropriations be made for the purpose of assisting commercial aeronautics, what specifically are the means or methods whereby this purpose is to be accomplished?

In order to attempt a clear conception of just what is involved in this question, let us assume that the Government has obligated itself to appropriate annually for a period of 10 years the sum of \$300,000,000 per year for the purpose of assisting commercial aeronautics. The total appropriation for these 10 years then amounts to \$3,000,000,000. Just how is this to be expended?

It is impossible, of course, to present here definite estimates covering such expenditures, but not more than 10 per cent of such appropriation need be devoted to subsidiary purposes, such as the development of the meteorological service, the procurement and the publication of maps, and the various other items enumerated above under paragraph 3 (f). It will also be admitted that allotments from the annual appropriations should be made for the establishment of commercial air routes. Such projects would demand large amounts of money; they would include the establishment of landing centers with an equipment of airdromes, machine shops, and personnel; the establishment of emergency landing fields between the large airdromes and the equipment of the landing centers with various means of telegraphic and radio communication or control and navigational aids. In other words, the project may be visualized by comparing it with the building of a railroad with roadbed, stations, roundhouses, telegraph lines, etc., complete except for rolling stock; and an invitation to private capital to provide the rolling stock and utilize the roadbed, free of charge. After all this is done, and after all of the various secondary matters have been given attention, there still remains in the realm of speculation the question as to whether or not private investors would utilize the air routes sufficiently to create what is being sought, namely, an adequate aircraft industry to meet the production needs of war.

If the air routes would be so utilized, then practically the entire appropriation could be utilized for the construction of such routes; if, on the other hand, the mere establishment of these routes does not produce the requisite air fleets to use them, it would be necessary to limit the portion of the appropriation used for these purposes and to retain a part of it for the purpose of rendering still more attractive to private capital the production and operation of air fleets. The further inducement necessary might take the form of direct subsidy, such as direct payment to any corporation or firm for the maintenance and service of an aeroplane and its pilot. Such subsidies have heretofore found no place in our government policy, but it seems more than likely that they will become necessary if we are to embark upon a program which has for its object the adequate preparedness of this country for air defense in case of war. It is reported by the French air attaché to the United States that in France direct subsidies are already in force. The French Government pays each company one-fourth of the price of the airplane provided that this machine is acceptable to the Government as being capable of rendering service in time of war. The Government also pays each company 10,000 francs per year per pilot as part salary for each pilot. In Great Britain the means so far employed are reported to be restricted to establishing and improving aerial routes, but the present indications give no assurance that the desired result will be attained thereby.

6. The present reported feverish activity for the development of "commercial aeronautics," of certain nations already saddled with enormous debts, under the guise of developing a new and highly lauded system of transportation is, as a matter of fact, nothing more than a new race for supremacy in armaments. The hope is expressed in the proposed treaties growing out of the World War that excessive armaments might be limited and thereby lessen the already great burden of taxation. It is not the intention of this board to deny the wisdom of a policy which will place this Nation in the front rank with regard to commercial aeronautics or a proper state of defense. It

is thought, however, that this question should be stripped entirely of its camouflage and that the Nation at large should be apprised of the real situation and the terms upon which it is to enter this contest.

7. (b) Is a separate department of aeronautics necessary to build up commercial aeronautics and control all questions relating thereto?

If a national policy be adopted by Congress covering a period of say not less than 10 years and providing for large annual appropriations for the development of commercial aeronautics, as indicated in paragraph 5, a suitable agency for administering the expenditure of these funds is necessary. Such an agency should naturally control also the procurement of all Government aircraft and aircraft material, the development work common to all types of aircraft, and many or all of the subsidiary activities mentioned in paragraph 3 (f). The determining factor as to the character which this governmental agency should assume is the size of such continued annual appropriations. If they are to be in the hundreds of millions of dollars annually, an executive department is suggested as a suitable solution. The question of the kind of agency that should be established if the Government does not accept the foregoing as a policy will be taken up in a later paragraph.

8. (c) If a separate aeronautical department or agency be established, should it include the aeronautical service of the Army and Navy?

It is believed that certain fundamental considerations regarding this question may be enunciated as follows:

(1) Military forces can not be efficiently trained nor can they operate efficiently without an air force.

NOTE.—The greatest deficiency of the American Air Force in the A. E. F. was that it had not been trained with the other combat branches of the Army. In the United States its camps were widely separated from the training camps for the combat troops. It was in no sense under the orders of such commanders. When it arrived in France it was again separated from the combat troops and came in contact with them only when it tried to help them in battle. Then it was found that neither the troops on the ground nor the flyers in the air understood how to get together in operations. Their training, therefore, had to be given them during battle, and an expensive training it was.

The fact has been generally overlooked in all discussions that the training of the other combat branches and liaison services of the Army can not be completely given without having available during their entire period of training air forces, not only flyers, but ground troops. It is just as important for all these forces to be trained with the air forces as it is for the air forces to be trained with them. This was clearly illustrated in some of our divisions in France who had been carefully trained in everything except working with air forces before they went into battle. When they went into battle, this training had to be given during battle, and it was a larger and more difficult problem and required a wider and greater effort to train the other combat branches to work with the air forces than it did to get the air forces to understand their method of working with the ground combat troops. The problem, therefore, must be looked upon from both sides. A military fighting unit composed of all arms can not be completely trained without having all arms, including air forces, as a part of it, because the training of each of the arms depends so largely upon its understanding of the powers, limitations, and duties of the other combat branches in the final team which makes the fighting unit. Such complete team work can not be brought about unless during peace as well as war all the elements which constitute the fighting unit, no matter how large that unit may be, form integrad parts thereof and are constantly under full military control.

(2) An air force acting independently can not win a war against a civilized nation nor, by itself, accomplish a decision against forces on the ground.

(3) With respect to an army, an air force is an essential combat branch and forms an integral part of that army as do the other combat branches. To insure success, the air force must be controlled in the same way, understand the same discipline, and act in accordance with the army command under precisely the same conditions as do the other branches.

(4) In order to establish the control in battle, as outlined under the preceding section, the air force, equally with the other branches, must fully understand its exact functions in working with them. It must know their needs. It must be in full sympathy with them. It must think in the same military atmosphere and have the same esprit de corps. Such conditions can not be

brought about in any force unless it is an integral part of the command, not only during battle but also during its entire period of its doctrinal training. It must be a part of such command in fact, and not a temporary attachment thereto.

(5) The foregoing apply equally to the Navy in practically all respects.

COROLLARY.—Whatever may be the decision as to a separate aeronautical department, the military air force must remain under the complete control of the Army and form an integral part thereof both in peace and in war.

9. This question stated at the beginning of paragraph 8, is perhaps of equal importance with the question as to the policy of the Government regarding national appropriations for the development of commercial aeronautics. The policy of the Government with respect to preparedness and appropriations for that purpose is distinctly one regarding which the Nation must rely upon Congress to furnish the proper solution. On the other hand, the effective organization for a proper defense is purely a military question and, while the ultimate authority for such an organization must be derived from Congress, it is assumed that in reaching its decision Congress would desire the opinions of experienced military and naval men. Generally speaking, military men of all armies who have had the widest experience in the study of problems of national defense and who during the World War were responsible for the successful conduct of large military operations, combining all means of combat, including aeronautics, are practically unanimous in the opinion that military aeronautics is in all respects a part of the Army, and that to transfer it to a department independent of the Army would seriously affect the efficiency of the Nation's combined forces as a fighting machine. Opposed to these views will be found the opinions of a certain number of military aviators. These adverse opinions have been given the most careful consideration. They carry on their face, however, limitations of vision regarding the great problems of the combination of all arms to accomplish decisive results. As technical experts in technical matters their views should be decisive; but even in the broader problems of commercial aeronautics itself, it is to be observed that the aviator does not determine general policy—business managers, financiers, and executives who have studied the general powers and limitations of aircraft are the men who determine upon and carry out the broader questions of policy.

10. In further support of the fundamental considerations stated in paragraph 9, the following quotations are submitted:

Sir Douglas Haig, commander in chief of the British expeditionary forces, in his final report, when speaking of airplanes, tanks, and other mechanical devices, says:

"It should never be forgotten, however, that weapons of this character are incapable of effective independent action. They do not in themselves possess the power to obtain a decision, their real function being to assist the Infantry to get to grips with their opponents. To place in them a reliance out of proportion to their real utility; to imagine, for example, that tanks and airplanes can take the place of infantry and artillery, would be to do a disservice to those who have the future of these new weapons most at heart by robbing them of the power to use them in their best effect."

Gen. Ludendorff speaks as follows:

"In order to provide aircraft support for the infantry, special battle airplane flights were formed. As had hitherto been done by individual airmen, they dived down from great heights and flew along at a low level, attacking with machine guns and light bombs the infantry lines, the artillery, and, as the practice extended, the enemy's reserves and transport columns, as well as columns of troops coming up from farther in rear.

"Airmen as line fighters: Originally intended to be an 'auxiliary' arm to the infantry, these battle flights were finally given important tactical tasks. Thus the air force gained a new field of activity of the greatest importance. The airmen, in the course of their duties, were not only reconnaissance troops who had to fight; they were not only bomb carriers for destructive work far in the enemy's rear, but they had, like infantry, artillery, and all other arms, to take part in the fighting on the ground.

"Like other combatant forces, they were a destructive arm in the great battle on land. This, indeed, became their main object, and the aerial combat was only a means of attaining it."

The board appointed by Gen. Pershing consisting of seven experienced officers, of which Maj. Gen. Joseph T. Dickman was president, reported on the tactical operations of air forces and the development of air forces as follows:

"(1). *Development—Tactics.*—The Air Service developed along the following general lines: (a) Observation, contact, and Artillery registration; (b) distant reconnoissance and bombing operations; (c) aerial combat; (d) combat against ground troops.

"(2) All four of these functions will continue in the future and increase in scope. However, the last is susceptible of greater development. The combat against ground troops did not become noticeable until 1918, and did not reach its maximum capabilities by the end of the war. This class of aerial work can be made more efficacious and decisive than the distant bombing operations and should receive the greatest attention.

"(3) In order to successfully combat this form of aerial attack, there appears to be no reason why an efficient and extensive counter-aerial service should not be developed. Hand in hand with the foregoing there must be a security aerial service; i. e., a service for the protection of the ground troops from aerial attacks.

"(4) The intimate association required between the ground troops and the aerial units assisting or operating with them demands that these two elements be an integral part of the same command; and as a consequence, the corps and divisions must have air units regularly assigned to them. These units must move with them and be considered just as much a part of the corps and division as the infantry, artillery, and other arms.

"(5) On the other hand, the aerial forces required for distant or strategical reconnoissance and bombing operations need have little association with the ground troops. The system of concentrating in the army troops all protection, reconnoissance, and bombing units has not met the battle-field needs and will be obsolete with future development.

"(6) Our experience, then, can be summarized as follows:

"The Air Service development, organization, and utilization should be (1) reconnoissance, contact, observation, and registration units to be integral elements of divisions and Army corps; (2) tactical combat and bombing units, and battle-field security service units to be integral parts of the Army corps and the Army; (3) strategical, bombing, reconnoissance, and combat units to be elements of the Army troops.

"(7) In general, nothing so far brought out in the war shows that aerial activities can be carried on independently of ground troops to such an extent as to materially affect the conduct of the war as a whole. It is possible, perhaps, that future wars may develop aerial forces of far greater extent than those provided in this war. It is safe to assume that air forces will not be developed for war purposes to such an extent as to largely supplant ground and water forces until such a proportion of the people become airfaring people as now are known as seafaring people. In other words, aerial activity must bear much the same relation to the commercial life of the Nation as at present seafaring activities bear to public trade and commerce.

"(8) There are two factors for the present which must be considered: First, the expensiveness of the material and the provision for its special maintenance. If it becomes possible to use in a war only aerial forces, the matter of expense is not a paramount question. But if, on the other hand, it is necessary to maintain ground and water forces for the war, then the expense of aerial forces must be considered and the aviation provided must bear its proper relation to the other forces.

"(9) Second, the question of a superior command must be considered. If a war should take place where only aerial forces are used, question of authority between ground and air forces naturally would not arise, because the superior command would rest in the proper air commander. When, however, ground forces are to be used, and so long as present conditions prevail we believe ground forces will continue to be the major part of those provided, the authority must be vested in the commander of the ground forces, and aviation must continue to be one of the auxiliaries of the principal arm—the Infantry. For the present all question of air tactics, air strategy, and employment of aviation must be governed by the well-known and established principles of military art. Superior officers must be so thoroughly well grounded in the fundamentals of war that this important auxiliary will be used always in pursuance of the paramount object."

Capt. H. C. Mustin, United States Navy, in his report to the Secretary of the Navy, based on his observations as a member of the American Aviation Mission, states:

"In both France and Italy it is believed that the scope of an air ministry should not include control of military and naval aviation personnel and operations. Also, it is believed that the Army and Navy should conduct independent training of their aviation personnel except in that time of tuition that is common to all classes of aviation; furthermore, they believe that each service should carry on the experimental aviation work that is of a nature exclusively military or naval, for that kind of work always requires the cooperation or assistance of other branches of the service it is developed for."

Capt. Mustin also states that the British Navy holds similar views.

A recent cable from the military attaché of the United States in London reports that the offices of the Royal Air Force believe in a separate air service, but that "Both the army and the navy are thoroughly opposed to plans for an independent air service, claiming that economy and efficiency in the field are only possible when air forces are under the control, respectively, of the army and the navy. In the opinion of our attaché, their motive is less selfish than that of the Royal Air Force. All are agreed that production and experiment should be under one head."

As shown in Appendix A, in both France and Italy, Army and Navy opinions are opposed to separating the air force from the Army and Navy.

11. Military air force not controlled by the Army and Navy: As an argument for a separate department of aeronautics, it is frequently stated that, during the recent war, the British found it necessary to reorganize their air service and to place the British Army and Navy air forces under an air ministry. Parts of this combined force were assigned to work with the Army and Navy, while a third part constituted an independent air force controlled by the air ministry in London. It is a matter of common report that this British policy was adopted for political rather than military reasons. The British air ministry was not established until 1918. The excellent record made by the British air service during the war was not the result of the establishment of this air ministry. Those give some credit to the air ministry for regulating production and distribution of available aircraft material. Other than this, the air ministry, as such, accomplished little of value. The important accomplishments under its direction were direct results of previous experience in the war, and were nothing more than the completion of work begun before the creation of the air ministry.

It would be a serious mistake to blindly follow any system that was adopted by a European nation under circumstances such as led to the adoption of the air ministry in Great Britain.

As a concrete instance of the dangers of following European methods and policies without giving them careful study may be cited the fact that after Gen. Pershing had studied the operations of the European allied armies who were at grips with the enemy in stabilized warfare, he was from the beginning convinced that the correct training of our Army was to prepare that Army for offensive operations in open warfare or warfare of movement. Under this doctrine the American Army was trained. Gen. Pershing constantly emphasized its importance. In his final instructions as he was forming his first American Army he instructed his subordinate commanders under date of July 11, 1918, that:

"1. The ultimate purpose of the American Army is the decisive defeat of the enemy, and not the mere passive result of the pure defensive. To realize this ultimate purpose, it is essential that every officer and soldier of these forces be imbued with the offensive spirit."

The system of training which Gen. Pershing adopted proved in the end to be correct and was directly at variance with the doctrine under which the allied armies had been training. Indeed, some of our own officers had come to the belief that training for trench warfare or warfare of position was the correct method of training and in a pamphlet issued by our War Department in 1917 for the training of Infantry we find in the first paragraph that "Training for trench warfare is of paramount importance." Upon the recommendation of Gen. Pershing, this was promptly revoked and we went to our traditional training for the offensive. After the great German offensive of March 21, and for which the German armies had been specifically trained, the allied commanders realized that they had been training under a wrong doctrine and

were obliged during the war to change their system of training and adopt the American method.

Any independent air force not completely controlled by the commander in chief in charge of operations and acting without instructions from him violates the well-known fundamental principle so forcefully exemplified during the world war that "unity of command is essential to the success of military operations." Any air force, whether we call it independent or not, if controlled by the commander in chief, will invariably be assigned such missions as will help in the accomplishment of the great objective for which the entire force is striving. The same air force, if not operating under the direct orders of the commander in chief, will occasionally accomplish useful missions in assisting the general objective, but under such circumstances any assistance given to the general plan will be incidental. As a matter of fact in the last analysis it was found that the so-called Independent Air Force of Great Britain really was no longer independent. The chief of that force was placed under the orders of the commander in chief of the allied armies. It was realized that acting independently he could accomplish practically nothing for the success of the campaign.

12. The activities of the military and naval services come together at the coast line only, and, in the case of aeronautics, overlap to a certain limited extent. Due partly to the press of war conditions, there has been a lack of complete coordination of these activities, resulting in some duplication of material and corresponding waste, inevitable in any war. This condition is being rapidly corrected. It is frequently stated that a Department of Aeronautics would obviate all such difficulties and is, in fact, necessary in order to effect the proper coordination of military and naval aeronautical activities. Such a suggestion for overcoming this particular difficulty takes no account of the fact that, in place of the coordination of only two services which have but the limited sphere of common activity (the coast line), the establishment of an Aeronautical Department controlling during war a military air force, independent of the Army and Navy, would require the coordination of three services instead of two, with spheres of common activity extending over the entire field of operations. Furthermore, the independent air force would tend to absorb an undue proportion of the maximum amount of aircraft that could be produced, to the detriment of effective action by the Army and Navy. These difficulties and tendencies together with the duplication of staff departments and supply services, complicating the system of supply, communications, and bases, would seriously handicap the offensive power of the military operations.

13. Under paragraph 7 was considered a suitable agency for the administration of funds under the assumption that the Government would obligate itself to large annual appropriations over a period of years for commercial aeronautics. The question will now be further discussed under the contingency that the Government will not adopt that as its policy. Should the Government adopt a policy whereby appropriations for aeronautics are not so large and whereby those appropriations which are made are to be devoted mainly to the improvement of the public service departments, such as the Post Office Department or the military and naval services, the requisite agencies for the expenditure of the appropriations are already in existence, in so far as it is a question of determining what is to be purchased. There still remains the question of so distributing the purchases as to protect and stimulate the manufacturing resources of the Nation. Competition between the purchasing departments would be directly detrimental to the interests of the Government, while entire lack of coordination would tend to disorganize the industry. This is a matter which can not be satisfactorily adjusted by a joint board on which only the departments interested are represented. In addition to their interests there is the public interest, which is concerned with the development of the producing industry. If this public interest is to be adequately conserved, a centralized agency having full power or control is essential. The situation does not seem to warrant the establishment of a separate department. A suitable organization for this purpose would be an aeronautical commission created by the President under specific provision of law—the head of this commission to be a civilian with the title of director of aeronautics, who should report the action of the commission direct to the President. On the commission should be one member from each Government department directly interested in aeronautics; also one civilian member representing, in general, the producing industries.

This commission should have authority to employ aeronautical engineers and experts of all classes, as well as the necessary administrative personnel to enable it to perform its functions, among which should be the following:

(1) Control of all national and international questions pertaining to civil aeronautics.

(2) (a) Prepare and submit estimates for appropriations necessary in the performance of its functions.

(b) Consolidate and transmit estimates submitted by all Government departments for aircraft and aircraft material.

(3) Control the procurement of all aircraft and aircraft material bought by the Government.

(4) Conduct all Government development work pertaining to aeronautics except such as pertains solely to the military and naval branches.

(5) Prepare to meet in case of war the demands of the military and naval services for increased production.

(6) The commission will not control the operation of aircraft in use by any Government department.

14. Congressional organizations for supervision of appropriations: One of the arguments in favor of the creation of an executive department of aeronautics is that such action would facilitate the creation of a single congressional committee to handle aircraft legislation and appropriations. At the present time these matters are in the hands of three or more committees, and it is difficult to secure adequate supervision of their action, but such supervision by a central committee of Congress will naturally result as to all major items if the recommendations of this board become effective.

15. Organization of military air force: There is no doubt that one of the sources, perhaps the most active source, of agitation for a separate department of aeronautics is the Air Service of the Army. It seems desirable that the reasons for this be stated fully and frankly. The important reasons appear to be:

(a) A belief that it is desirable and essential to create a force for fighting purposes independent of either the Army or Navy.

(b) A belief that no future exists for the personnel of the Air Service so long as it remains a part of the Army.

(c) A belief that a military air force suitable to our position in the world will not be developed under the Army, but that aeronautics will continue to be regarded as an auxiliary to other branches.

There are various other viewpoints of less importance and for which less justification appears.

It does not seem necessary to enumerate or discuss the minor questions involved but the three viewpoints above enumerated deserve careful study. We have already set forth the consensus of opinion among all military and naval men, with the exception of some military aviators, regarding (a) a military air force independent of either the Army or Navy. With respect to the other two questions they pertain exclusively to our own service rather than to the broader aspects of aeronautics. In so far as they are based upon the recommendations of the War Department as to the future organization of the Air Service in the proposed reorganization of the Army, it must be admitted that they are not altogether groundless. This board is convinced that permanency of commission in the Air Service, should be the same in all grades where it is practicable as is the case in other combat branches of the Army. Compared to other activities the period of a man's life during which he may be expected to accomplish first-class results as an aviator is short. This is an admitted fact which must be faced and which can not fail to have an important bearing upon the question of an organization of an air force. Only a careful study, in which the best talent of the Air Service is utilized, can determine the maximum number of grades in which commissions should be permanent. It is not believed that the instructions to the present board require such a study, but it is thought proper that the necessity therefor should be suggested.

As to the adequate development of the Air Service, it is thought that the pessimism now existing would in large measure disappear if provision were made for permanency in commission in that service, a suitable organization provided, and provision made for details from the Air Service the same as from the other branches of the Army, and especially details to the General Staff and to the service schools.

16. Conclusions: (1) Peace-time air fleets at all adequate in size for war needs can not be maintained by any nation. The great air fleets necessary for war must be produced after war begins.

(2) To provide facilities for aircraft production at the beginning of war, commercial aeronautics must be developed.

(3) Under present conditions, the only effective stimulant to the development of commercial aeronautics is Government assistance in large annual appropriations guaranteed for a period of a considerable number of years. If this policy be adopted by the Government, these appropriations, in order to accomplish the result desired, must be continued until commercial aeronautics can stand by itself as a dividend-paying business.

(4) The Government itself should not undertake the production of aircraft in Government factories unless trade combinations in the production of military aircraft should eventually be formed against it.

(5) Federal agencies should be provided for the adequate control of various national and international matters connected with aeronautics.

(6) A single Government agency should be responsible for the procurement of all aircraft used in the Government service.

(7) A single Government agency should have charge of all development work, in so far as same is common to all branches—military, naval, and commercial. This agency should be provided with the means to carry on experimentation and research.

(8) The military and naval air forces should remain in integral parts of the Army and Navy and be completely under their respective controls both in peace and in war, no matter what may be the decision as to the establishment of a separate aeronautical department or agency.

(9) There should not be created any military air force independent of Army or Navy control.

17. Recommendations: As a result of its deliberations and conclusions, the board submits the following recommendations:

(a) That the Army and Navy retain as integral and essential elements of their organizations and operating respectively under their complete control all military and naval air forces that may be provided by Congress.

(b) That further study be given the question of the details of organization of the air force for the Army, bearing in mind the fact that a military air force is an essential combatant branch of the service and should, in so far as may be practicable, be placed on an equal footing with the Infantry, Cavalry, and Artillery; and that in seeking the proper solution to this problem the personnel of the existing air service should be given full opportunity for an expression of their views and an adequate voice in the final determination.

(c) That Congress be requested to decide whether it desires:

(1) To make large annual appropriations guaranteed over a period of say not less than 10 years for the stimulation of commercial aeronautics.

(2) To make appropriations which are to be devoted mainly to the improvement of the public-service departments, such as the Post Office Department or military and naval services.

(d) If the policy indicated under (c)–(1) be adopted, a commission should be provided with personnel, powers, and duties as outlined in paragraph 13 of this report.

18. There being no further business before it, the board adjourned sine die at 11.25 p. m., October 27, 1919.

CHARLES T. MENOHER,

Major General, United States Army, President of the Board.

FRANK W. COE,

Major General, United States Army.

WILLIAM J. SNOW,

Major General, United States Army, Recorder.

(Board of officers convened to report upon the New and Curry bills which proposed the creation of an executive department of aeronautics.)

Mr. MAGEE. We must get somebody other than the Secretary of War who has manifold other duties that ordinarily would require the attention of several very able men and the same way with the Secretary of the Navy, but it seems to me that if we are ever going to make any progress in aviation and get where we are going to get, that we have got to have somebody other than one who is in office, who will have the time to think of nothing but that.

Col. GORRELL. Exactly, sir. This report which I have handed you was released by the Secretary of War and in releasing it the Secretary of War agreed with this board's reports, except in two

points. He differed with it on two points. The report says that this civilian agency should report direct to the President. The Secretary of War said that there are already too many committees reporting direct to the President and that the tendency of legislation by Congress should be to decrease rather than increase this number. The Secretary of War gave a second objection, viz, that he did not believe in permanency of commissions in the Army Air Service. The board did not attempt to convey the idea of complete permanency of commissions throughout the Air Service. The board advocated permanency of such commissions only in so far as it is practicable. It figured that this would extend down to include the grade of major or perhaps 10 per cent of the captains so as to give the Air Service officers a career and yet not cause stagnation at the top, which would be harmful to the Air Service.

Mr. MAGEE. Who are on the board?

Col. GORRELL. Maj. Gen. Charles T. Menoher, Director of Air Service, and formerly commanding general of the Forty-second Division; Maj. Gen. Frank W. Coe, Chief of Coast Artillery, a general who used aircraft in connection with artillery in the vicinity of Mailly; Maj. Gen. W. G. Haan, Director War Plans Division, General Staff, and formerly commanding general of the Thirty-second Division; Maj. Gen. William J. Snow, Chief of Field Artillery. Above all things, they are officers well qualified to express an opinion on the combined use of all the national efforts in national defense.

Mr. LEA. I would like to have the best views on this subject.

Col. GORRELL. I indorse all that is in that report.

Mr. MAGEE. If we have the conclusions of the board that will answer our purpose. What are we doing now in aviation? Have we any planes building?

Col. GORRELL. No, sir.

Mr. MAGEE. Has the Army any training schools?

Col. GORRELL. I do not know of any activity going on in them now.

Mr. MAGEE. I notice on the Pacific coast that the Navy Department is advertising that they have so many schools here in operation. Do you know anything about that?

Col. GORRELL. No, sir; I do not.

Mr. MAGEE. I was wondering whether or not the Army had established any schools that were actually in operation.

Col. GORRELL. All I know about are two elementary schools, one at Rockwell Field, and one at Carlstrom Field, Fla., near Arcadia. These are elementary schools. Then we plan to have the men go from these elementary schools to schools where they will learn the more advanced types of aviation work, such as bombardment and pursuit work. But that system has not been put into effect at this time.

Mr. MAGEE. I assume that practically no preparations were made in the United States for efficient aviation service prior to the time we entered the war.

Col. GORRELL. That is true. It was a new proposition entirely.

Mr. MAGEE. It does not seem to me that we ought to permit ourselves to get in that position again.

Col. GORRELL. Exactly, sir.

Mr. MAGEE. The question is what we ought to do to make such preparations as to put us in an advantageous position in case of a future war.

Col. GORRELL. Yes, sir. I think the answer really comes down to a question of money, sir.

Mr. MAGEE. Well, now, if you take the question of money. Suppose you had a separate department, as you suggest, or an independent bureau for the commercial end of it and the Army had its separate branch and the Navy its separate branch. Then you would give our appropriations to this one civilian branch. That is recommended in that report?

Col. GORRELL. Yes, sir. The idea is that that be made to this civilian department.

Mr. MAGEE. How does the Army operate its end?

Col. GORRELL. The civilian department makes up its estimate for the funds it needs for its own use, and the chiefs of the Army and Navy Departments what they need for aircraft. The civilian agency expends that money for aircraft and aircraft accessories, and the Army and the Navy and all other Government departments obtain their share by requisitions from the civilian agency, which acts as a supply department. Of course, such requisitioned materials should be charged against the funds appropriated for the separate department. For example, you will appropriate so much for civilian, so much for Navy, and so much for Army aeronautics, etc. There will be one aviation appropriation incorporating therein an itemized statement of the amounts intended for the Army, Navy, Post Office, civilian, etc., air activities. You will still appropriate money for your Army to include funds for the buildings to house your flyers, funds that go to pay the flyers, funds that pay for the coal to heat the buildings and food for the soldiers, but this central agency controls the funds for aircraft and aircraft supplies, and the Army and Navy, as I said before, get such material by requisitions upon the central agency.

You appropriate so much for civilian aviation and it is up to that civilian agency to encourage commercial aeronautics. This will not be possible without a large expenditure of funds. Should you decide to appropriate a large amount of money, say \$200,000,000 or \$300,000,000, over a period of at least each of 10 consecutive years (you would have to continue your program for at least that number of years if you wish it to become a success), then you should have an executive department to handle that enormous sum of money and to give the push and impetus required for success in commercial aviation. If you appropriate only small sums of money, barely enough for the Army and Navy and Post Office air services, there would be almost no progress possible in commercial aeronautics. I would then recommend an aircraft commission, of which the chief should be a civilian with the title of director of aeronautics, and on the commission would be represented each of the Government departments utilizing aviation and also the aircraft industry. You can pick from civilian life some very good man to appoint as director of aeronautics. I wouldn't pick a man who knows a lot about aviation. My idea is not to necessarily put a man in charge who is a flyer. A man who makes such decisions as will be required of this director of aeronautics should be a man having

some knowledge of aviation, but also should be a big business man. I would want a man who knew a great deal about the business of organizing huge projects—men like those who built up our railroad systems.

Mr. MAGEE. If you want to get any benefit for your service, at least you would have to get somebody to direct it who knows something about it.

Col. GORRELL. Yes, sir; but if you as a business man were to personally put up \$1,000,000 to start an aviation company it would be a very big man that you would pick to head your company, and this big organizer would choose some advisers who were flyers and aviators of wide experience. That is the way I see it. He may be a flyer or not, but he should be the biggest organizer and business man one could get. Not a man from the Army Air Service, Navy Air Service, or Post Office Air Service, but a big organizer who could have flyers about him.

Mr. MAGEE. What has Great Britain done in regard to air service?

Col. GORRELL. She has created an air ministry controlling all aeronautics, the only exception being that certain officers from the Army and Navy are taken into the air force for temporary details and trained with a view of being sent to serve in the air units loaned to the Army and Navy.

Mr. MAGEE. Then they have a separate department?

Col. GORRELL. Yes, sir. The air ministry was really "put over" on the British by Lord Northcliffe's press. The success of the British air force on the front was founded prior to the beginning of the air ministry and can not be credited to the air ministry, which did not go into effect until 1918. It you notice, the British Army and Navy are both against the principle of an air ministry. France and Italy have not and will not establish air ministries to include their military and naval air forces, and the army in both France and Italy are against such an establishment. France is creating what you might call a coordinating agency which will exercise no control over the military and naval air forces except coordination.

The agency will also act as a supply and development bureau. It is an independent agency which has no control over the army and navy air forces except to coordinate and prevent competition. In this board report of general officers is quoted Ludendorf, Sir Douglas Haig, the A. E. F. superior board on tactics, and there is also given information received from each of the foreign countries. It shows that the armies and navies of the whole world are unanimous in their conviction that no air force should be created separate from the army and the navy. Of course, when the mechanics of the airplane has developed to such an extent as to bring the advent of the day when airplanes can leave England or France, fly to and drop a quantity of heavy bombs on New York, and then fly back again to Europe without landing en route, your problem of organization will be different from that confronting you now. Under the present conditions and under existing facts, we must organize an air force and a national defense that will be successful in war either 5 or 10 or 15 years from now. Under existing conditions, you must not and you can not have a successful air force in war if it be separated from the Army and the Navy. You must, however, have some sort of a civil

agency to handle the questions which I have just mentioned as allotted to it.

Mr. MAGEE. Your views are embodied in this report?

Mr. LEA. To what extent did we contribute to the allied air cause, by furnishing the services of men and material?

Col. GORRELL. I have made up a list which shows the air effort loaned to the Allies, the man power, and the length of time they served with allied armies. As to material, I have only general knowledge to give you. The J. G. White contract involved about 22,000 tons of material to be shipped to France. Ninety-nine per cent was shipped and 90 per cent delivered to the French. There was enough material for 5,000 Hispano-Suiza engines, 3,000 Gnome engines, 1,500 Renault engines, 1,500 Breguet airplanes, and 300 Spad airplanes. We delivered to the Allies some 77,732,748 feet of aircraft timber. In addition to that we delivered to them certain dope, which is mentioned in the letter which Mr. Frear has had inserted into the record. In other words, America was the supply depot for such things as could not be obtained. On page 555 of your printed record you already have a statement given by the Air Service concerning the contracts made for the delivery of material in Europe.

AMERICAN AIR SERVICE PERSONNEL LOANED TO ALLIES.

France.—Individual pilots and observers loaned to French Air Service, 315. American squadrons loaned to French Army: One hundred and third Pursuit Squadron with French, approximately six months; Ninety-ninth Observation Squadron with French, approximately one month; Two hundred and fifty-eighth Squadron with French, approximately one month; First pursuit group (formed entire pursuit aviation with French Sixth Army) with French months of July and August (— Squadrons), one and one-half months; 28 companies of motor mechanics (approximately 4,200 officers and men) on duty with French, nine months; motor mechanics personnel on duty November 11, 1918, with French, 109 officers and 4,744 men.

England.—Individual pilots loaned to British Expeditionary Forces, 274. American squadrons with British Expeditionary Forces: Seventeenth Pursuit Squadron with British Expeditionary Forces, approximately four months; Twenty-second Pursuit Squadron with British Expeditionary Forces, approximately four months; Twenty-eighth Pursuit Squadron with British Expeditionary Forces, approximately four months; One hundred and forty-eighth Pursuit Squadron with British Expeditionary Forces, approximately four months; on duty in England November 11, 1918, 765 officers and 19,307 men; on duty with British Expeditionary Forces (France, Nov. 11, 1918), 49 officers and 525 men.

Date.	Officers.	15,000 agreement; Dec. 5, 1917.		Handley-Paige agreement.	
		Service and repair (15,000 required).	Con- struction and labor (6,200 required).	Service and corps.	Con- struction and labor (3,000 required).
1918.					
Jan. 1.....	224	951	1		
Feb. 1.....	246	1,375			
Mar. 1.....	409	3,931	1,188		
Apr. 1.....	660	10,819	1,188		
May 1.....	636	11,896	2,616		
June 1.....	646	13,470	2,616		
July 1.....	599	12,834	2,866		
Aug. 1.....	503	13,629	3,676		
Sept. 1.....	760	16,224	5,884	431	
Oct. 1.....	898	14,858	3,653	1,602	2,215
Nov. 1.....	894	11,682	3,648	1,653	2,192

Italian: Individual pilots loaned Italy, 65. Air Service personnel on duty with Italian air service (Nov. 11), 112 officers and 59 men.

Mr. LEA. The other day Mr. Frear or Mr. Magee asked for some information—whichever one it was—some example of how long it took you to get an aircraft plant into operation. That is, the amount of gauges and dies and tools that were necessary.

Col. GORRELL. I have a brief statement based on the best accomplishment of American production, so that you would have no trouble to ascertain the shortest time limit required to get into production. I will give this example of what the Lincoln Motor Co. did in producing engines.

Mr. FREAR. Where is that company located.

Col. GORRELL. At Detroit, Mich. The motor production required was 70 12-cylinder motors per day. The Lincoln Motor Co.'s two plants contained 725,000 square feet of floor space and cost \$8,500,000 for the plants, which were built, equipped, and put into operation within a period of five months from the date the first contract was let. No doubt the company knew they would get the order, and they did some preliminary work. An idea of the plants may be obtained when it is realized that it required 88 draftsmen and designers seven months to design the 6,522 different special tools the company needed to manufacture these engines; there were 91,807 special tools made by 89 separate concerns located in different parts of the country, extending from Maine to Illinois.

The number of different parts put into a Liberty engine is 433, and the total of all parts is 3,397. These figures do not give a true conception of the task, however. When the special tools required for the various parts are considered, the magnitude of the undertaking becomes apparent. The following list of special tools makes a list of interest. To make a crank case there are required gauges, and fixtures to the extent of 403, cutting tools, 207; special gauges, 187; to make the connecting rod 374 gauges and fixtures are required, 123 cutting tools, and 232 special gauges. To make a cylinder you require 349 gauges and fixtures, 207 cutting tools, and 273 special gauges. In other words, for crank cases, you will require 827 tools, for the connecting rods 739, and for the cylinder 829 tools, or a total of 2,395 tools. You can see what havoc would result if you would go into a new design.

Mr. MAGEE. When they were getting into the production of airplane engines, there was a great deal of delay caused by constant changing of plans, wasn't there?

Col. GORRELL. So I understand from the papers and the previous hearings; yes.

Mr. MAGEE. Of course, if the plant undertook to manufacture a certain piece of machinery and then the plans would change every 48 hours, necessarily it would be very great.

Col. GORRELL. Of course, however, that was to be expected in this country for this reason—the American Expeditionary Forces was not able to send back to this country complete drawings of airplanes and engines. Most of the tolerances were in the heads of the European workmen and production drawings were not required in European factories where handwork was in vogue. Therefore, production drawings were not in use in Europe. Before this war we had

developed only a handful of aeronautical engineers. Consequently, when these men came to design equipment, about which they hardly knew anything, mistakes were bound to happen, and many changes had to be made in the drawings.

Mr. LEA. Have you any information as to the number of parts in Liberty engines as compared with other engines?

Col. GORRELL. Take its nearest competitor, there are at least 200 less parts in the Liberty than in the Rolls-Royce. The Rolls-Royce is too difficult to compare. There are at least 200 more parts in it. The figure is probably greater than 200.

The question has been asked if I could tell the committee what attacks were going on on the western front during our attack on St. Mihiel. I have brought a chart which shows the attacks launched by the Allies beginning July 18 and extending to November 11, 1918.

The chart shows that on July 18, 1918, the Allies launched their great counterattack against the Boche lines just south of Soissons—a combined attack by the French, American, and British troops. After that, it was prolonged to other sectors of the front. Near Soissons was where the famous wedge was driven home by the First and Second American Divisions and the French Moroccan Division on July 18, 1918. From that date on, the chart shows that the Allies never let up, but they gave the Boche right and the left hand punches, one rapidly following the other. It was from September 12 to September 15 when the American forces, aided by the French, made a drive on the Boche at St. Mihiel. The French occupied the point of the salient and followed up the retreating Germans. The Argonne fighting extended from the Argonne Forest across to the River Meuse. You can see by that how the American front expanded. Two days before the armistice the American Second Army began an attack. The Americans at the time of the armistice were holding a longer front than the British and the Belgians combined; and in addition to that, they held certain portions of the French front and certain other portions of the British and Belgian fronts. The Germans could not tell where an attack was going to come from, and he had at all times to keep all his fronts alert. This prevented either his air or ground troop concentrations of overwhelming strength at any point on his own front and used up his reserves.

(Illustration omitted in printing; on file with the committee.)

Mr. LEA. Can you now state, Col. Gorrell, if any amount was paid by the Government on account of the contract for the Spads which was canceled?

Col. GORRELL. The Air Service record shows no money expended on the Spads contract. The possibility is that the money involved went over to be charged against future work to be carried on by the Curtiss Co. Also the Curtiss Co. record shows that the material which would have been utilized on Spads could be utilized in their future work.

Mr. LEA. Did the Curtiss Co. present any claims for damages on the Spad contract which was canceled?

Col. GORRELL. In looking over the Air-Service record, I can find no such claim for damage for the cancellation of the Spad contract.

Mr. LEA. Then the loss must have gone over into some other contract.

Col. GORRELL. Yes, the loss must have been taken over on some other contract.

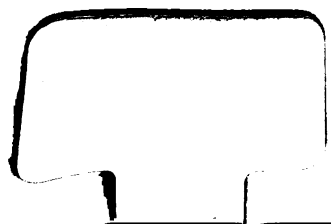
Mr. MAGEE. What is this Spad contract?

Col. GORRELL. This was the contract made by the United States Government and the Curtiss Co. for some 1,500 Spad pursuit airplanes, and it was never executed, so far as I know. No claim was made by the company against the Government on any part of it.

Mr. LEA. The other day, I think Mr. Frear asked you for some information in regard to Hispano-Suiza engines, manufactured for the French Government. Can you give me any figures in regard to the number manufactured?

Col. GORRELL. I think 479 would include the total delivered to the French before the day of the armistice. I inquired in France and was told that they had received none before we entered the war.

(Thereupon the subcommittee stood adjourned subject to call.)



LIBRARY OF CONGRESS



0 018 699 976 9

